DUKE ENERGY

GRID IMPROVEMENT PLAN

SOUTH CAROLINA

2018

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Contents

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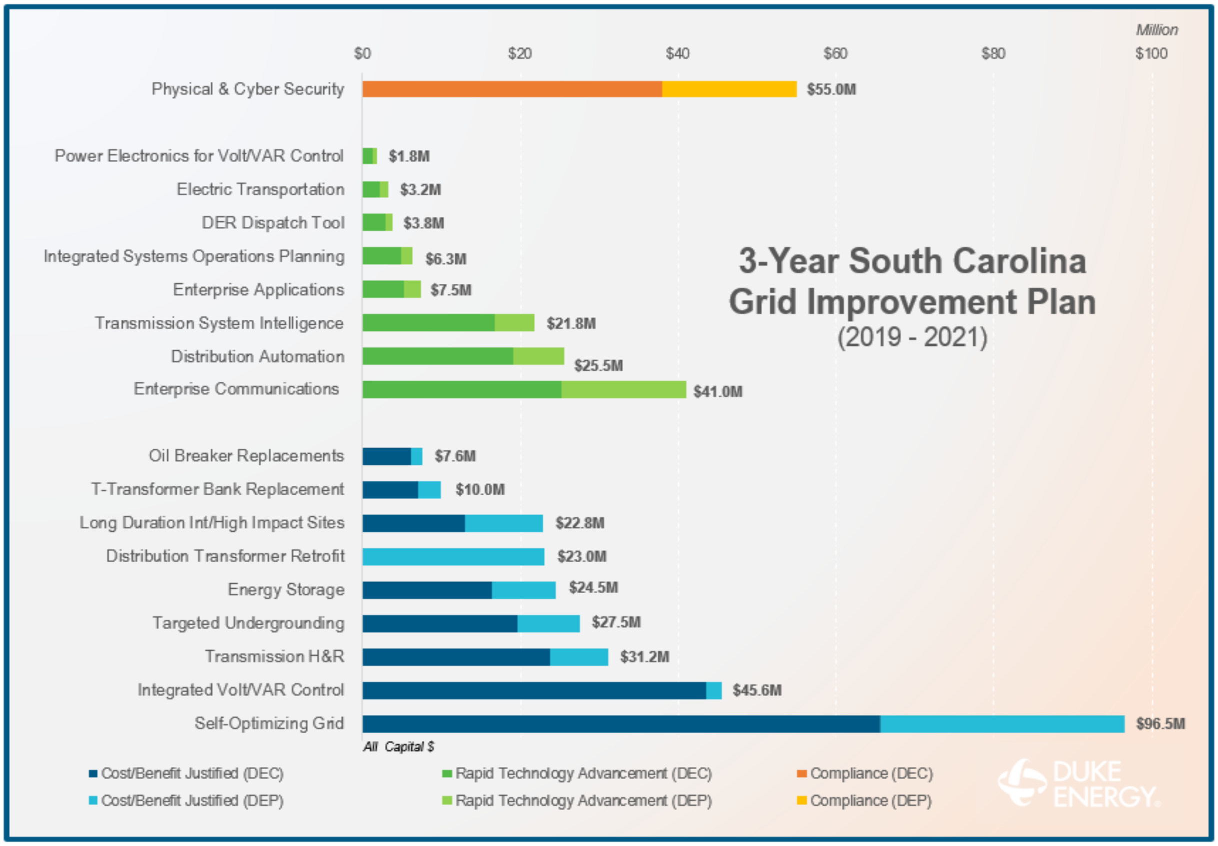
GRID IMPROVEMENT PLAN OVERVIEW

Duke Energy's 2019-2022 South Carolina Grid Investment. Plan and associated three-year investments are summarized below. Additional program level details are provided in the section that follows.



		2019		2020		2021	
	3-Yr Total	DEC	DEP	DEC	DEP	DEC	DEP
TOTAL	**$454,588**	**$70,036**	**$22,528**	**$110,519**	**$48,651**	**$130,250**	**$72,604**
Cost Benefit & Cost Effectiveness Justified	**$288,685**	**$36,824**	**$13,307**	**$71,622**	**$24,903**	**$86,773**	**$55,257**
Self-Optimizing Grid	$96,546	$19,566	$5,890	$23,253	$7,087	$22,745	$18,005
Integrated Volt/VAR Control	$45,605	--	--	$15,195	$1,000	$28,410	$1,000
Transmission H&R	$31,150	$4,780	$550	$11,010	$2,800	$8,010	$4,000
Targeted Undergrounding	$27,500	$5,390	$1,610	$7,315	$2,185	$6,970	$4,030
Energy Storage	$24,481	$281	$84	$45	$13	$16,045	$8,013
Distribution Transformer Retrofit	$22,996	--	$3,600	--	$7,396	--	$12,000
Long Duration Int/High Impact Sites	$22,840	$5,267	$1,573	$7,700	$2,300	--	$6,000
T-Transformer Bank Replacement	$10,002	--	--	$4,813	$1,438	$2,313	$1,438
Oil Breaker Replacements	$7,565	$1,540	--	$2,291	$684	$2,280	$771
Rapid Tech Advancement: Cost-Effectiveness Justified	**$110,931**	**$14,902**	**$5,206**	**$30,826**	**$14,836**	**$31,946**	**$13,216**
Enterprise Communications	$41,016	$5,232	$2,550	$9,754	$7,810	$10,296	$5,374
Distribution Automation	$25,517	$3,957	$1,139	$7,155	$2,420	$7,937	$2,909
Transmission System Intelligence	$21,823	$1,348	--	$7,748	$2,314	$7,581	$2,832
Enterprise Applications	$7,455	$1,575	$436	$1,906	$847	$1,865	$826
Integrated Systems Operations Planning	$6,283	$1,073	$321	$2,122	$634	$1,643	$491
DER Dispatch Tool	$3,800	$616	$184	$770	$230	$1,540	$460
Electric Transportation	$3,200	$1,100	$500	$1,100	$500	--	--
Power Electronics for Volt/VAR Control	$1,836	--	$76	$271	$81	$1,084	$324
Compliance: Cost Effectiveness Justified	**$54,972**	**$18,311**	**$4,015**	**$8,072**	**$8,912**	**$11,531**	**$4,131**
Physical & Cyber Security	$54,972	$18,311	$4,015	$8,072	$8,912	$11,531	$4,131

Capital $ in thousands (rounded to nearest thousand)

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PROGRAM DESCRIPTIONS & SCOPES

The remaining sections of this document describe the each of the South Carolina Grid Improvement programs and sub-programs, as well as their detailed three-year project scopes for years 2019 through 2021.

Notes:

1) Costs shown are capital costs
2) Units shown represent approximate number of units

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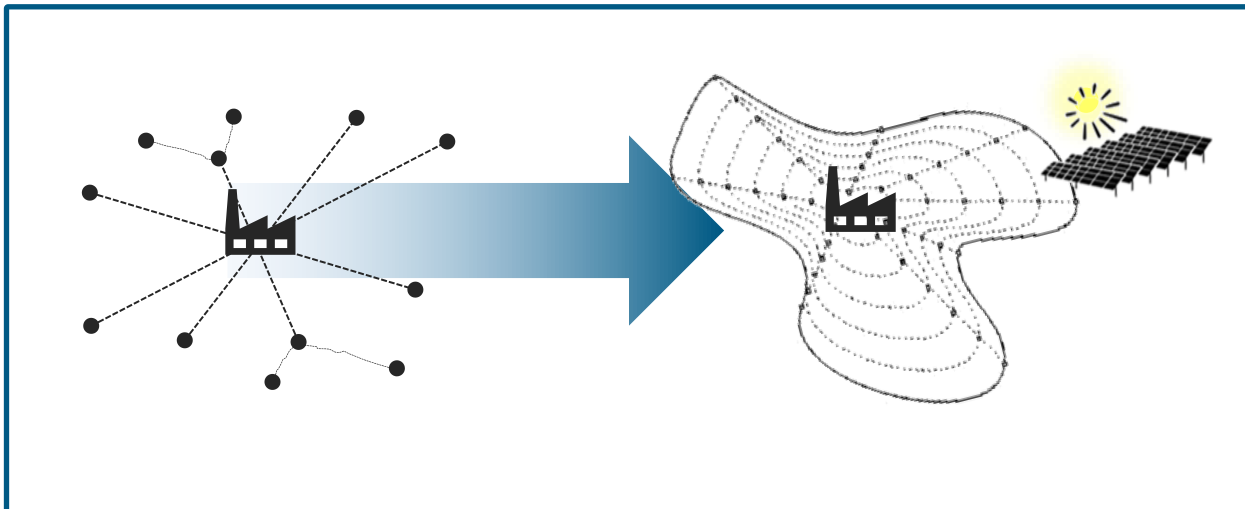
I. Self-Optimizing Grid (SOG)

The current grid has limited ability to reroute or rapidly restore power and limited ability to optimize for the growing penetrations of distributed energy resources (DER). The Self-Optimizing Grid (SOG) program is established to address both of these issues.

The SOG program consists of three (3) major components: grid capacity, grid connectivity, and automation and intelligence. The SOG program redesigns key portions of the distribution system and transforms it into a dynamic smart-thinking, self-healing grid. The grid will have the ability to automatically reroute power around trouble areas, like a tree on a power line, to quickly restore power to the maximum number of customers and rapidly dispatch line crews directly to the source of the outage. Self-healing technologies can reduce outage impacts by as much as 75 percent.

The **SOG Capacity projects** focus on expanding substation and distribution line capacity to allow for two-way power flow. **SOG Connectivity projects** create tie points between circuits. **SOG Automation projects** provide intelligence and control for the Self Optimizing Grid. Automation projects enable the grid to dynamically reconfigure around trouble and better manage local DER.



The Self Optimizing Grid program transforms radial one-way circuits into a smart-thinking two-way energy network.

3-Year Scope *(Self Optimizing Grid)*

The charts below outline the 3-Year SOG Scope in South Carolina (DEC and DEP):

	Duke Energy Carolinas			Duke Energy Progress		
Self Optimizing Grid	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
TOTAL	**$19,566,000**	**$23,253,000**	**$22,745,000**	**$5,890,000**	**$7,087,000**	**$18,005,000**
Automation & Segmentation	$6,444,000	$6,282,000	$6,225,000	$1,970,307	$1,890,655	$5,760,000
Approx. No. of Switches	*100*	*103*	*94*	*39*	*25*	*68*
Modular Dist Control Device POC	$21,000	$22,000	$15,000	-	-	-
Capacity & Connectivity	$4,135,000	$7,700,000	$7,550,000	$1,235,000	$2,300,000	$7,450,000
Approx. Circuit Miles	*11*	*18*	*20*	*6*	*8*	*20 to 24*
Substation Bank Capacity	$6,376,000	$6,160,000	$6,200,000	$1,904,000	$1,840,000	$3,800,000
Advanced DMS*	$2,590,000	$3,088,000	$2,755,000	$780,000	$1,056,000	$995,000

** required for SOG scalability and IVVC functionality*

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2019 Locations *(Self Optimizing Grid)*

Year	SC DEC	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2019	Anderson	TOXAWAY TIE	04181206	0	0
2019	Anderson	DAVIS RET	04171204	2	0
2019	Anderson	DOCHENO RET	04031201	1	0
2019	Anderson	TOXAWAY TIE	04181212	1	0
2019	Anderson	TOXAWAY TIE	04181211	1	44
2019	Anderson	TOXAWAY TIE	04181207	0	114
2019	Anderson	PLAINVIEW RET	04281206	0	212
2019	Anderson	PLAINVIEW RET	04281205	3	275
2019	Anderson	PLAINVIEW RET	04281212	1	373
2019	Anderson	CATHEY RD RET	04371206	1	1,273
2019	Anderson	WHITEHALL RET	04231210	0	2,451
2019	Anderson	TOXAWAY TIE	04181210	1	7,910
2019	Duncan	PEBBLE CREEK RET	08441206	3	7,982
2019	Duncan	BERRY SHOALS RET	08271201	2	0
2019	Duncan	HIGHTOWER RET	08041205	2	0
2019	Duncan	HIGHTOWER RET	08041207	3	1,126
2019	Duncan	DUNCAN RET	08121203	1	0
2019	Duncan	PEBBLE CREEK RET	08441207	2	0
2019	Duncan	PELHAM RET	08032402	2	0
2019	Duncan	ONEAL RET	08421206	3	60
2019	Duncan	DUNCAN RET	08121202	1	4,178
2019	Duncan	HIGHTOWER RET	08041208	1	221
2019	Duncan	HIGHTOWER RET	08041213	2	318
2019	Duncan	HIGHTOWER RET	08041206	0	616
2019	Duncan	LELIA RET	08161203	0	716
2019	Duncan	PELHAM RET	08032406	3	11,275
2019	Fort Mill	MCALPINE CREEK RET	01302415	5	0
2019	Fort Mill	ARROWOOD RET	01252405	0	0
2019	Fort Mill	INDIAN LAND RET	72782401	10	0
2019	Fort Mill	TEGA CAY RET	01792409	8	0
2019	Simpsonville	HOLCOMBE RD RET	02271202	2	0
2019	Simpsonville	WARE PLACE RET	02671201	2	0
2019	Simpsonville	BRENTWOOD RET	02081211	2	892
2019	Simpsonville	BRENTWOOD RET	02081205	2	0
2019	Simpsonville	E GANTT RET	02171201	1	32
2019	Simpsonville	SCUFFLETOWN RET	02581204	2	3,309
2019	Spartanburg	BOILING SPRINGS RET	60291207	2	0
2019	Spartanburg	PINEWOOD RET	60101205	1	0
2019	Spartanburg	HILLBROOK RET	60091206	0	0
2019	Spartanburg	UNA RET	60011212	2	122
2019	Spartanburg	MUD CREEK RD RET	60271207	0	399
2019	Spartanburg	CAMP CROFT RET	60081212	2	4,122

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Year	SC DEC	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2019	Spartanburg	PETERS CREEK RET	60161202	2	573
2019	Travelers Rest	DANIELS RET	02131209	3	0
2019	Travelers Rest	WADDELL RD RET	02651204	3	443
2019	Wenwood	EASTOVER RET	02191210	3	0
2019	Wenwood	KINGSGATE RET	02321208	3	58
2019	Wenwood	WRENN RET	02821209	2	0
2019	Wenwood	CONWAY RET	02121205	4	112
2019	Wenwood	ROPER MTN RET	02551205	0	181
2019	Wenwood	WRENN RET	02821208	3	247
2019	Wenwood	EASTOVER RET	02191203	0	1,493
2019	Wenwood	CONWAY RET	02121204	0	2,345
2019	Wenwood	AUGUSTA RD RET	02031202	0	3,085
2019	Wenwood	CONWAY RET	02121207	0	4,664

Year	SC DEP	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2019	Florence	FLORENCE WEST 230KV	T2835B02	8	
2019	Florence	FLORENCE BURCHS CROSSROADS 115KV	T2822B02	9	
2019	Florence	FLORENCE 230KV	T2840B26	5	20,275
2019	Marion County	NICHOLS 115KV	T3035B01	8	10,032
2019	Sumter	SUMTER WEDGEFIELD RD. 230KV	T3985B04	9	

2020 Locations *(Self Optimizing Grid)*

Year	SC DEC	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2020	Anderson	TOXAWAY TIE	04181208	2	216
2020	Anderson	FANTS GROVE RET	04351206	1	1,154
2020	Duncan	ONEAL RET	08421207	2	276
2020	Duncan	MASCOT RET	60241204	1	11,203
2020	Fort Mill	MCALPINE CREEK RET	01302407	4	0
2020	Fort Mill	PIPER GLEN RET	01222411	7	105
2020	Fort Mill	MCALPINE CREEK RET	01302414	5	304
2020	Fort Mill	WITHERS RET	01652402	6	1,396
2020	Fort Mill	PIPER GLEN RET	01222403	5	2,185
2020	Fort Mill	KNIGHTS RET	72702405	0	2,494
2020	Fort Mill	FOREST LAKE RET	72722402	4	7,595
2020	Simpsonville	GREENBRIAR SW STA	02841211	3	0

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Year	SC DEC	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2020	Simpsonville	SCUFFLETOWN RET	02581203	1	24,321
2020	Simpsonville	BRENTWOOD RET	02081209	2	81
2020	Simpsonville	BRENTWOOD RET	02081206	4	3,067
2020	Spartanburg	CHESNEE RET	60251203	3	0
2020	Spartanburg	COWPENS RET	60191201	2	147
2020	Spartanburg	BOILING SPRINGS RET	60291208	2	344
2020	Spartanburg	KNOLLWOOD RET	60151208	2	427
2020	Spartanburg	CHESNEE RET	60251202	3	704
2020	Spartanburg	UNA RET	60011209	0	2,615
2020	Spartanburg	WADSWORTH RET	60141209	0	6,073
2020	Spartanburg	KNOLLWOOD RET	60151207	1	6,120
2020	Travelers Rest	TIGERVILLE RET	02611203	2	0
2020	Travelers Rest	WADDELL RD RET	02651207	3	64
2020	Travelers Rest	BEREA RD RET	02071204	4	73
2020	Travelers Rest	LANGSTON CREEK RET	02331207	4	458
2020	Travelers Rest	LANGSTON CREEK RET	02331206	3	846
2020	Travelers Rest	DANIELS RET	02131208	2	1,105
2020	Travelers Rest	PEBBLE CREEK RET	02441205	4	11,604
2020	Wenwood	CONWAY RET	02121203	4	0
2020	Wenwood	WRENN RET	02821206	2	151
2020	Wenwood	AUGUSTA RD RET	02031204	3	187
2020	Wenwood	CONWAY RET	02121206	3	204
2020	Wenwood	VERDAE RET	02851204	3	336
2020	Wenwood	AUGUSTA RD RET	02031203	4	407
2020	Wenwood	BAINBRIDGE RET	02051205	2	589
2020	Wenwood	PIEDMONT RET	02511202	0	8,867

Year	SC DEP	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2020	Florence	FLORENCE EBENEZER 230KV	T2824B03	2	
2020	Florence	FLORENCE SOUTH 115KV	T2830B02	2	
2020	Florence	FLORENCE BURCHS CROSSROADS 115KV	T2822B03	1	
2020	Hartsville	ELLIOTT 230KV	T3360B01	0	
2020	Hartsville	HARTSVILLE 115KV	T3680B11	3	
2020	Hartsville	HARTSVILLE 115KV	T3680B10	1	37,858
2020	Hartsville	HARTSVILLE SEGARS MILL 230KV	T3665B02	1	5,069
2020	Hartsville	DARLINGTON 115KV	T2710B01	2	
2020	Hartsville	DARLINGTON 115KV	T2710B02	3	
2020	Marion County	DILLON 115KV	T2750B04	1	

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Year	SC DEP	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2020	Marion County	DILLON MAPLE 230KV	T2745B01	1	
2020	Marion County	MARION 230KV	T3010B13	0	
2020	Marion County	MARION 230KV	T3010B12	1	
2020	Sumter	SUMTER ALICE DRIVE 230KV	T3966B01	2	
2020	Sumter	ELGIN 115KV	T3550B01	0	
2020	Sumter	SUMMERTON 230KV	T3965B01	0	
2020	Sumter	CAMDEN 230KV	T3391B01	2	
2020	Sumter	SUMTER ALICE DRIVE 230KV	T3966B03	3	

2021 Locations *(Self Optimizing Grid)*

Year	SC DEC	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2021	Anderson	BYRUM CREEK RET	04011205	3	363
2021	Anderson	CATHEY RD RET	04371208	3	382
2021	Anderson	PLAINVIEW RET	04281211	1	754
2021	Anderson	FLAT ROCK RET	04311202	2	1,341
2021	Anderson	SANDY SPRINGS RET	04141202	1	12,715
2021	Duncan	CAMPTON RET	60071206	2	547
2021	Duncan	WOODRUFF RET	60211203	2	3,183
2021	Duncan	DUNCAN RET	08121201	3	9,235
2021	Fort Mill	TEGA CAY RET	72792405	4	0
2021	Fort Mill	FISHER SS	01542401	7	200
2021	Fort Mill	PIPER GLEN RET	01222412	3	226
2021	Fort Mill	HENSLEY RD RET	72771202	4	377
2021	Greenwood	CORONACA RET	07301203	2	0
2021	Greenwood	JOHNS CREEK RET	07541209	3	5,351
2021	Simpsonville	GREENBRIAR SW STA	02841207	2	0
2021	Simpsonville	GREENBRIAR SW STA	02841209	3	1,572
2021	Simpsonville	WARE PLACE RET	02671203	1	2,455
2021	Simpsonville	GREENBRIAR SW STA	02841212	1	3,713
2021	Simpsonville	HOLCOMBE RD RET	02271204	2	4,817
2021	Spartanburg	BOILING SPRINGS RET	60291209	2	25
2021	Spartanburg	HAMPTON AVE RET	60051205	2	63
2021	Spartanburg	COWPENS RET	60191202	1	132
2021	Spartanburg	SOUTHPORT RD RET	60511202	2	231
2021	Spartanburg	WADSWORTH RET	60141208	2	5,472
2021	Spartanburg	PETERS CREEK RET	60161201	0	1,801
2021	Spartanburg	CHESNEE RET	60251201	3	3,075
2021	Spartanburg	KNOLLWOOD RET	60151214	2	4,986
2021	Spartanburg	KNOLLWOOD RET	60151211	3	10,664

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Year	SC DEC	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2021	Spartanburg	ROSE HILL RET	60301204	3	11,480
2021	Travelers Rest	EBENEZER RET	02211202	3	1,421
2021	Travelers Rest	PEBBLE CREEK RET	02441204	2	1,632
2021	Travelers Rest	TIGERVILLE RET	02611201	1	1,722
2021	Travelers Rest	GREENVILLE MN	02231203	4	3,474
2021	Wenwood	PELZER RET	02471201	2	209
2021	Wenwood	PELZER RET	02471202	1	282
2021	Wenwood	BRUSHY CREEK RET	02091212	4	988
2021	Wenwood	ROPER MTN RET	02551212	4	1,209
2021	Wenwood	VERDAE RET	02852404	0	1,468
2021	Wenwood	LAUREL CREEK RET	02351210	2	2,051
2021	Wenwood	ROPER MTN RET	02551211	2	6,268

Year	SC DEP	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2021	Cheraw	CHERAW REID PARK 230KV	T3445B02	1	N/A
2021	Cheraw	CHERAW 115KV	T3450B03	0	N/A
2021	Cheraw	CHERAW 115KV	T3450B04	0	N/A
2021	Cheraw	CHESTERFIELD 115KV	T3460B01	0	N/A
2021	Cheraw	MCCOLL 230KV	T3760B02	0	N/A
2021	Cheraw	MCCOLL 230KV	T3760B01	0	N/A
2021	Cheraw	CHERAW REID PARK 230KV	T3445B04	0	N/A
2021	Cheraw	CHESTERFIELD 115KV	T3460B02	1	N/A
2021	Florence	FLORENCE MARS BLUFF 115KV	T2825B01	0	N/A
2021	Florence	SARDIS 230KV	T3107B13	1	N/A
2021	Florence	FLORENCE 230KV	T2840B21	3	N/A
2021	Florence	FLORENCE 230KV	T2840B24	2	N/A
2021	Florence	FLORENCE MARS BLUFF 115KV	T2825B02	3	N/A
2021	Florence	FLORENCE CASHUA 230KV	T2826B01	3	N/A
2021	Florence	PAMPLICO 115KV	T3060B02	0	N/A
2021	Florence	FLORENCE SOUTH 115KV	T2830B05	5	N/A
2021	Florence	FLORENCE 230KV	T2840B22	4	N/A
2021	Florence	FLORENCE MARS BLUFF 115KV	T2825B03	3	N/A
2021	Florence	FLORENCE EBENEZER 230KV	T2824B02	2	N/A
2021	Hartsville	HARTSVILLE 115KV	T3680B14	0	N/A
2021	Hartsville	HARTSVILLE SEGARS MILL 230KV	T3665B03	0	N/A
2021	Hartsville	HARTSVILLE SEGARS MILL 230KV	T3665B05	0	N/A
2021	Hartsville	ELLIOTT 230KV	T3360B02	0	N/A
2021	Hartsville	HARTSVILLE SEGARS MILL 230KV	T3665B04	0	N/A
2021	Hartsville	HARTSVILLE 115KV	T3680B15	1	N/A

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Year	SC DEP	Substation Name	Circuit ID	Approx. No. Automated Switches	Approx. Wire Capacity Upgrade (feet)
2021	Hartsville	HARTSVILLE 115KV	T3680B12	1	N/A
2021	Kingstree	ANDREWS 115KV	T2660B02	0	N/A
2021	Kingstree	HEMINGWAY 115KV	T2890B01	0	N/A
2021	Kingstree	HEMINGWAY 115KV	T2890B02	1	N/A
2021	Kingstree	KINGSTREE 230KV	T2930B04	9	N/A
2021	Kingstree	LAKE CITY 230KV	T2950B03	0	N/A
2021	Kingstree	KINGSTREE 230KV	T2930B03	2	N/A
2021	Kingstree	OLANTA 230KV	T3040B02	0	N/A
2021	Marion County	MULLINS 115KV	T3030B04	1	N/A
2021	Marion County	DILLON 115KV	T2750B07	3	N/A
2021	Marion County	MARION BYPASS 115KV	T3005B02	0	N/A
2021	Marion County	MULLINS 115KV	T3030B02	0	N/A
2021	Marion County	MARION BYPASS 115KV	T3005B05	1	N/A
2021	Marion County	DILLON 115KV	T2750B03	0	N/A
2021	Marion County	MULLINS 115KV	T3030B01	0	N/A
2021	Marion County	DILLON 115KV	T2750B02	0	N/A
2021	Marion County	MARION 230KV	T3010B10	1	N/A
2021	Sumter	SUMTER 230KV	T4000B24	3	N/A
2021	Sumter	SUMTER 230KV	T4000B26	2	N/A
2021	Sumter	CAMDEN 230KV	T3391B02	3	N/A
2021	Sumter	SUMTER 230KV	T4000B20	1	N/A
2021	Sumter	SUMTER NORTH 230KV	T3980B03	0	N/A
2021	Sumter	SUMTER NORTH 230KV	T3980B01	3	N/A
2021	Sumter	SUMTER NORTH 230KV	T3980B05	3	N/A
2021	Sumter	SUMTER 230KV	T4000B21	1	N/A
2021	Sumter	MANNING 115KV	T3750B01	2	N/A

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II. Distribution Hardening and Resiliency (H&R) – Flood Hardening

In hurricane events like Hurricane Floyd and more recently Hurricanes Matthew and Florence, significant flooding was a major factor impacting restoration. Smart, targeted investments can mitigate the scale of impacts on communities and customers adjacent to these areas prone to extreme flooding. Hardening lines and structures is a balanced approach that can keep power and critical services available to some portion of a community and prevent a widespread outage in an area until flooding recedes.

The Distribution Hardening and Resiliency (H&R) – Flood Hardening program includes the following:

- Alternate power feeds for substations in flood-prone areas, and for radial power lines that cross into and through flood-prone areas
- Hardened river crossings where power lines are vulnerable to elevated water levels during extreme flooding
- Improved guying for at-risk structures within flood zones

EXtreme Substation Flooding

Locations *(Distribution H&R – Flood Hardening)*

- As candidate projects are identified, they will be considered for inclusion into the Long Duration Interruption/High Impact Site program 3-year budget.


Substation Flood Mitigation


EXtreme Substation Flooding

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III. Distribution Transformer Retrofit

Like the Self-Optimizing Grid program, the new sectionalization capability offered by the Distribution Transformer Retrofit program minimizes the number of customers impacted by a fault or failure on the power line. In addition, the new protective features that mitigate equipment vulnerabilities work to significantly lower the risk of an outage occurring at the transformer all together.

The core activities of the transformer retrofit program include the installation of a fuse disconnect device on the high-voltage side of every overhead transformer to protect upstream customers from a fault at or downstream of the transformer. In addition, through protective device coordination, the local fused disconnect can be set to prevent any upstream operations of reclosing devices (the source of momentary outages for customers not served by the retrofitted transformer.)

Consistent with modern transformer standards, the program also retrofits transformers with additional protective elements to reduce the risk of external factors such as lightning strikes and animal interference.

Non-Retrofitted Transformer

Retrofitted Transformer

3-Year Scope *(Transformer Retrofit)*

The SC specific detailed implementation plan for 2019 – 2021 is as follows:

DEP Retrofits	2019	2020	2021
Costs	$3,600,000	$7,396,000	$12,000,000
Units	*3,000*	*6,163*	*10,000*

2019 Locations *(Transformer Retrofit)*

Year	Ops Center	Substation Name	Circuit ID	Approx. # Overhead Transformers
2019	FLORENCE	KINGSTREE 230KV	T2930B03	335
2019	FLORENCE	KINGSTREE 230KV	T2930B04	686
2019	HARTSVILLE	BISHOPVILLE 230KV	T3350B01	456
2019	HARTSVILLE	BISHOPVILLE 230KV	T3350B02	1015
2019	HARTSVILLE	BISHOPVILLE 230KV	T3350B03	78
2019	HARTSVILLE	BISHOPVILLE 230KV	T3350B04	40
2019	HARTSVILLE	CHERAW-REID PARK 230KV	T3445B01	62
2019	HARTSVILLE	CHERAW-REID PARK 230KV	T3445B01	417

2020 Locations *(Transformer Retrofit)*

Year	Ops Center	Substation Name	Circuit ID	Approx. No. of Overhead Transformers
2020	HARTSVILLE	CHERAW-REID PARK 230KV	T3445B03	302
2020	HARTSVILLE	CHERAW-REID PARK 230KV	T3445B04	388
2020	HARTSVILLE	CHERAW-REID PARK 230KV	T3445B05	58
2020	HARTSVILLE	SUMTER 230KV	T4000B20	599
2020	HARTSVILLE	SUMTER 230KV	T4000B21	304
2020	HARTSVILLE	SUMTER 230KV	T4000B22	30
2020	HARTSVILLE	SUMTER 230KV	T4000B24	593
2020	HARTSVILLE	SUMTER 230KV	T4000B25	136
2020	HARTSVILLE	SUMTER 230KV	T4000B26	202
2020	HARTSVILLE	SUMTER 230KV	T4000B26	61
2020	HARTSVILLE	CHESTERFIELD 115KV	T3460B01	453
2020	FLORENCE	OLANTA 230KV	T3040B02	1012

2020-2021 Candidate Locations *(Transformer Retrofit)*

Year	Substation Name	Feeder Name	Approx. No. of Overhead Transformers
2020 - 2021	SUMTER NORTH 230KV	NORTH MAIN 23KV	367
2020 - 2021	SUMTER NORTH 230KV	MATHIS STREET	755
2020 - 2021	SUMTER NORTH 230KV	MILLER ROAD 23KV	224
2020 - 2021	SUMTER ALICE DRIVE 230KV	WESMARK 23KV	148
2020 - 2021	SUMTER ALICE DRIVE 230KV	ALICE DRIVE 23KV	260
2020 - 2021	SUMMERTON 230KV	SUMMERTON 23KV	356
2020 - 2021	MCCOLL 230KV	CLIO 23KV	653
2020 - 2021	MCCOLL 230KV	MCCOLL 23KV	644
2020 - 2021	MANNING 115KV	US 301 SOUTH 24KV	386
2020 - 2021	MANNING 115KV	MANNING 24KV	203
2020 - 2021	HARTSVILLE 115KV	PRESTWOOD 23KV	206
2020 - 2021	HARTSVILLE 115KV	BYRDTOWN 23KV	674
2020 - 2021	HARTSVILLE 115KV	FOURTEENTH ST23KV	253
2020 - 2021	HARTSVILLE 115KV	LAURENS AVENUE 23KV	152
2020 - 2021	HARTSVILLE 115KV	TENTH STREET 23KV	497
2020 - 2021	HARTSVILLE SEGARS MILL 230KV	FOXHOLLOW 24KV	595
2020 - 2021	HARTSVILLE SEGARS MILL 230KV	PINERIDGE 24KV	379
2020 - 2021	HARTSVILLE SEGARS MILL 230KV	CLUB COLONY 24KV	325
2020 - 2021	HARTSVILLE SEGARS MILL 230KV	WEST CAROLINA 24K	322
2020 - 2021	ELGIN 115KV	ELGIN 23KV	112
2020 - 2021	CHESTERFIELD 115KV	RUBY 24KV	760
2020 - 2021	CHERAW 115KV	STATE ROAD 23KV	331

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Year	Substation Name	Feeder Name	Approx. No. of Overhead Transformers
2020 - 2021	CHERAW 115KV	CITY 23KV	271
2020 - 2021	CAMDEN 230KV	LUGOFF 23KV	308
2020 - 2021	CAMDEN 230KV	WATEREE 23KV	483
2020 - 2021	ELLIOTT 230KV	LYNCHBURG 23KV	945
2020 - 2021	ELLIOTT 230KV	LAMAR 23KV	365
2020 - 2021	SARDIS 230KV	ELIM 24KV	945
2020 - 2021	PAMPLICO 115KV	SALEM CROSS 23KV	803
2020 - 2021	MULLINS 115KV	ACADEMY ST 23KV	246
2020 - 2021	MULLINS 115KV	BLUFF ROAD 23KV	627
2020 - 2021	MULLINS 115KV	MULLINS 23KV	520
2020 - 2021	MARION 230KV	ENGLISH PARK 23KV	857
2020 - 2021	MARION 230KV	MARION CITY 23KV	204
2020 - 2021	MARION 230KV	LIBERTY STREET 23KV	273
2020 - 2021	MARION BYPASS 115KV	CENTENARY 23KV	726
2020 - 2021	MARION BYPASS 115KV	AYNOR 23KV	839
2020 - 2021	LAKE CITY 230KV	MAIN STREET 23KV	455
2020 - 2021	HEMINGWAY 115KV	JOHNSONVILLE 23KV	535
2020 - 2021	HEMINGWAY 115KV	HEMINGWAY 23KV	550
2020 - 2021	FLORENCE 230KV	DARLINGTON ST 23KV	220
2020 - 2021	FLORENCE 230KV	KOPPERS 23KV	290
2020 - 2021	FLORENCE 230KV	WEST 23KV	313
2020 - 2021	FLORENCE SOUTH 115KV	SWEETBRIAR 23KV	194
2020 - 2021	FLORENCE SOUTH 115KV	MCCOWN DRIVE 23KV	190
2020 - 2021	FLORENCE CASHUA 230KV	MCLEOD BLVD 23KV	191
2020 - 2021	FLORENCE MARS BLUFF 115KV	TREMONT 24 KV	303
2020 - 2021	FLORENCE MARS BLUFF 115KV	FRANCIS MARION 24KV	411
2020 - 2021	FLORENCE MARS BLUFF 115KV	CCSC 24KV	441
2020 - 2021	FLORENCE EBENEZER 230KV	FOREST LAKE 23KV	181
2020 - 2021	FLORENCE EBENEZER 230KV	BOTANY 23KV	140
2020 - 2021	FLORENCE BURCHS CR 115KV	PARKWOOD 24KV	173
2020 - 2021	DILLON 115KV	HOSPITAL 23KV	373
2020 - 2021	DILLON 115KV	INDUSTRIAL 23KV	314
2020 - 2021	DILLON 115KV	DILLON 23KV	730
2020 - 2021	DILLON 115KV	DIXIANA 23KV	400
2020 - 2021	DILLON MAPLE 230KV	VILLAGE 23KV	477
2020 - 2021	DARLINGTON 115KV	SMITH AVENUE 23KV	360
2020 - 2021	DARLINGTON 115KV	RUSSELL STREET 23KV	320
2020 - 2021	ANDREWS 115KV	GEORGETOWN TEXT 23K	382

Circuits will be selected in accordance with overhead work in other programs such as SOG and IVVC for efficiency of construction resources.

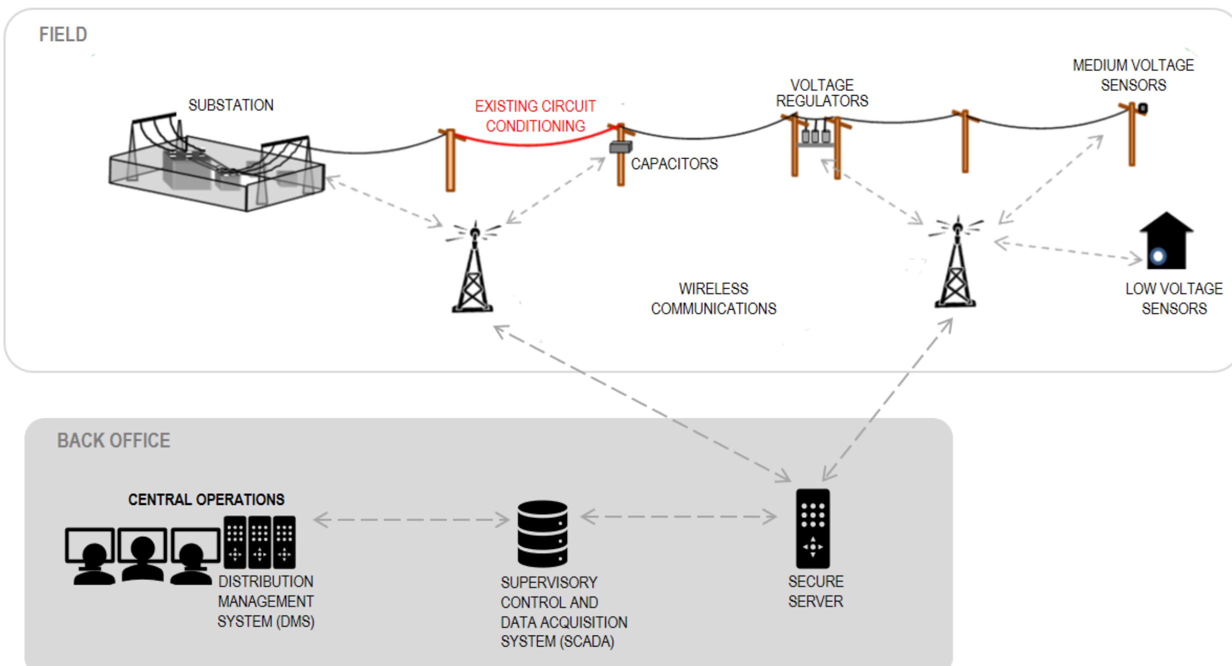
Oliver Exhibit 9

IV. Integrated Volt/VAR Control (IVVC)

Integrated Volt/VAR Control (IVVC) allows the distribution system to optimize voltage and reactive power needs. The program employs remotely operated substation and distribution line devices such as voltage regulators and capacitors. The settings for thousands of these controllable field devices are optimized and dispatched via a distribution management system.

IVVC capabilities enable a grid operator to lower voltage as a way of reducing peak demand (peak shaving), thereby reducing the need to generate or purchase additional power at peak prices, or protecting the system from exceeding its load limitations. The current DEP **Distribution System Demand Response (DSDR)** program uses the peak shaving mode of IVVC to support emergency load reduction.

Another operational mode enabled by IVVC capabilities on the distribution system is **Conservation Voltage Reduction (CVR)**. CVR uses IVVC during periods of more typical electricity demand to reduce overall energy consumption and system losses.



3 -Year Scope *(Integrated Volt/VAR Control)*

The South Carolina specific 3-year scope includes the following capital budget and scope. Note, that the DEC IVVC program will be implemented over a four-year period (2020 – 2023) with 2019 serving as a planning year.

	Duke Energy Carolinas			*Duke Energy Progress*		
Integrated Volt/VAR Control	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Costs	--	$15,195,000	$28,410,000	--	$1,000,000	$1,000,000
Approx. No. of Substation	--	*15*	*28*	--	--	--
Approx. No. of Circuits	--	*107*	*149*	--	--	--

Oliver Exhibit 9

DEC Locations *(Integrated Volt/VAR Control)*

2020

Substation Name	Area	Approx. No. of Circuits
KNOLLWOOD RET	Spartanburg	8
HIGHTOWER RET	Greenville	8
BRENTWOOD RET	Simpsonville	7
GREENBRIAR SW STA	Simpsonville	7
PEBBLE CREEK RET	Greenville	6
WADDELL RD RET	Travelers Rest	9
AUGUSTA RD RET	Greenville	8
GREENVILLE MN	Travelers Rest	8
INDIAN LAND RET	Fort Mill	5
BOILING SPRINGS RET	Spartanburg	6
DANIELS RET	Travelers Rest	6
CONWAY RET	Greenville	7
PUTMAN RET	Simpsonville	10
BAINBRIDGE RET	Greenville	6
WRENN RET	Greenville	6
	TOTAL:	107

Smart Capacitor Bank

2021

Substation Name	Area	Approx. No. of Circuits
HILLBROOK RET	Spartanburg	6
LANGSTON CREEK RET	Travelers Rest	4
HUDSON ST RET	Travelers Rest	9
CAMPTON RET	Spartanburg	5
EASTOVER RET	Greenville	9
TEGA CAY RET	Fort Mill	3
HAMPTON AVE RET	Spartanburg	8
OAKVALE TIE	Greenville	5
ONEAL RET	Greenville	4
UNA RET	Spartanburg	7
CAMP CROFT RET	Spartanburg	6
LAUREL CREEK RET	Greenville	8
PELHAM RET	Greenville	7
LELIA RET	Greenville	5
BRUSHY CREEK RET	Greenville	7
ROPER MTN RET	Greenville	9
CHESNEE RET	Spartanburg	3
BERRY SHOALS RET	Greenville	4
DUNCAN RET	Greenville	3
HOLCOMBE RD RET	Simpsonville	3
FISHER SS	Fort Mill	3
WADSWORTH RET	Spartanburg	5
BEREA RD RET	Travelers Rest	3
PINEWOOD RET	Spartanburg	9
POWDERSVILLE RET	Greenville	3
SCUFFLETOWN RET	Simpsonville	3
VERDAE RET	Greenville	5
APALACHE RET	Greenville	3
	TOTAL:	149

V. Transmission Hardening and Resiliency (H&R)

Each the four Transmission H&R sub-programs work to address unique challenges in ways that harden the system, and not only minimize impacts to customers, but enhance their electric service experience. The **44-kV System Upgrade** subprogram both protects the 44-kV system from extreme weather, but also paves the way for more DER interconnections by creating additional capacity on the system to transport generation from large scale solar sites. Similarly, the **Targeted Line Rebuild for Extreme Weather** subprogram protects some of the higher voltage transmission lines from extreme weather by addressing vulnerable wooden structures.

The **Networking Radially Served Substations** subprogram builds in more resiliency to the transmission system by creating alternative ways to provide customers with reliable electricity supply in the case of an issue with the primary transmission feed; and, the **Substation Flood Mitigation** subprogram builds in protection for substations most vulnerable to flood damage. Altogether, these H&R efforts not only enhance the functionality of individual assets, but substantially improve the overall functionality of the system, particularly under extreme weather conditions. The long-term plan for hardening and resiliency is to relocate or strengthen at-risk assets or other solutions such as raising the floodplain at that site.

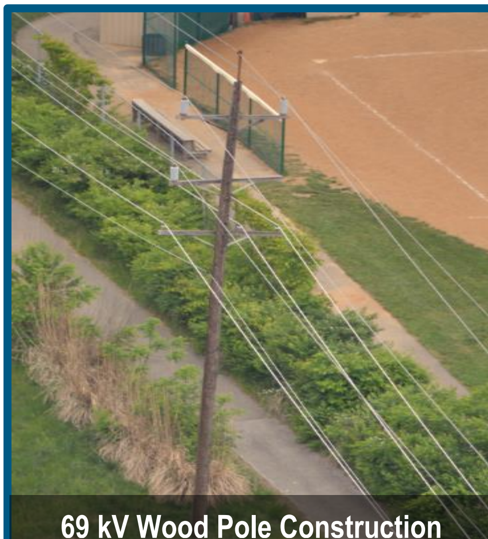
3-Year Scope *(Transmission Hardening and Resiliency) - projected SC portion of project costs*

	Duke Energy Carolinas			Duke Energy Progress		
Trans H&R	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Costs	$4,780,000	$11,010,000	$8,010,000	$550,000	$2,800,000	$4,000,000

* Actual costs will be captured on a per-site basis. This approach allows the Company to bundle multiple programs at the same site for better cost efficiency

2019 - 2021 Candidate Locations *(Transmission Hardening and Resiliency)*

- Specific details for transmission project locations and timelines is provided in ***Appendix A: Transmission Project Scopes***.



69 kV Wood Pole Construction

69 kV Steel Pole Construction

Oliver Exhibit 9

VI. Transformer Bank Replacement

Predictive and proactive replacement programs like Transformer Bank Replacement significantly reduce the impacts and costs of replacement when compared to performing the same work following a catastrophic failure.

The objective of this program is to anticipate future transformer failures and replace those transformers in an orderly fashion, avoiding the cost and customer outage minutes associated with these failures. Catastrophic failures often result in significant oil spills, requiring expensive cleanup and other mitigation. Proactive replacement also reduces contingent material inventory needed, since replacements have a 12-24-month manufacturing lead time.

Typical Transmission-to-Transmission Transformer

Typical Transmission-to -Distribution Transformer

3-Year Scope *(Transformer Bank Replacement) - projected SC portion of project costs*

	Duke Energy Carolinas			Duke Energy Progress		
Trans Bank Replacement	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Costs	$0	$4,812,500	$2,312,500	$0	$1,437,500	$1,437,500

* Actual costs will be captured on a per-site basis. This approach allows the Company to bundle multiple programs at the same site for better cost efficiency

2019 - 2021 Candidate Locations *(Transmission Transformer Bank Replacements)*

- Specific details for transmission project locations and timelines is provided in ***Appendix A: Transmission Project Scopes***.

VII. Transmission System Intelligence

The Transmission System Intelligence program will reduce the duration and impacts associated with transmission system issues. Improvements in transmission system device communication capabilities enable better protection and monitoring of system equipment. The data collected from intelligent communication equipment helps better assess and optimize transmission asset health.

The Transmission System Intelligence program includes 1) the replacement of electromechanical relays with remotely operated digital relays, 2) the implementation of intelligence and monitoring technology capable of providing asset health data and driving predictive maintenance programs, and 3) the deployment of remote monitoring and control functionality for substation devices, and rapid service restoration.

Electromechanical Relays (Typical)

Digital Relays

3-Year Scope *(Transmission System Intelligence) – projected SC portion of project costs*

	Duke Energy Carolinas			Duke Energy Progress		
Transmission Sys Intel	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
TOTAL*	***$1,347,500***	***$7,748,125***	***$7,580,625***	***$0***	***$2,314,375***	***$2,831,875***
Sys Intel & Monitoring	$577,500	$1,155,000	$1,232,500	$0	$345,000	$517,500
Digital Relay Upgrades	$577,500	$3,465,000	$3,235,000	$0	$1,035,000	$1,265,000
Remote Sub Monitoring	$0	$962,500	$962,500	$0	$287,500	$287,500
Remote Controlled Switches	$192,500	$2,165,625	$2,150,625	$0	$646,875	$761,875

* Actual costs will be captured on a per-site basis. This approach allows the Company to bundle multiple programs at the same site for better cost efficiency.

2019 - 2021 Candidate Locations (Transmission System Intelligence)

- Specific details for transmission project locations and timelines is provided in ***Appendix A: Transmission Project Scopes***.

VIII. Oil Breaker Replacement

The purpose of the Oil Breaker Replacement program is to replace these legacy assets with breaker technology capable of two-way communications and remote operations. Transmission level oil breakers will be replaced with the modern sulfur hexafluoride gas (SF6) circuit breaker technology. The medium voltage distribution level oil-filled breakers will be replaced with modern vacuum circuit breaker technology. The new communication and control capabilities of this modern technology better positions the transmission and distribution systems to work with grid automation systems to better respond to electric grid events. Looking forward, these fast-response gas and vacuum breakers are better suited for protecting circuits with higher solar and other variable energy resource penetration.

Typical Transmission Oil Breaker

Typical Transmission SF_6 Gas Breaker

3-Year Scope *(Oil Breaker Replacement) -- projected SC portion of project costs*

	Duke Energy Carolinas			*Duke Energy Progress*		
Oil Breaker Replacement	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
TOTAL	**$1,540,000**	**$2,291,000**	**$2,280,000**	**$-**	**$684,000**	**$771,000**
D-Oil Breaker Replacements	$770,000	$847,000	$847,000	$-	$253,000	$253,000
T-Oil Breaker Replacements	$770,000	$1,444,000	$1,433,000	$-	$431,000	$518,000

* Actual costs will be captured on a per-site basis. This approach allows the Company to bundle multiple programs at the same site for better cost efficiency

2019 - 2021 Candidate Locations *(Oil Breaker Replacements)*

- Specific details for transmission project locations and timelines is provided in ***Appendix A: Transmission Project Scopes***.

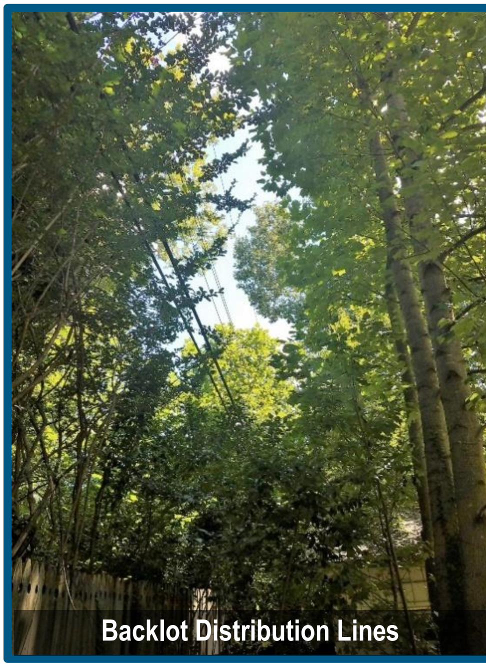
IX. Targeted Undergrounding (TUG)

Overhead power line segments with a history of unusually high numbers of outages drive a disproportionate amount of momentary interruptions and outages that affect Duke Energy's customers. When these segments of lines fail, they cause problems for Duke Energy's customers directly served by them as well as customers upstream. Lines targeted to be moved underground are typically the most resource-intensive parts of the grid to repair after a major storm. Equipment on these line segments can experience shortened equipment life and additional equipment-related service interruptions.

The goal of the TUG program is to maximize the number of outage events eliminated. Converting outage prone parts of the system enables Duke Energy to restore service more quickly and cost effectively for all customers. Addressing areas with outlier outage performance improves service while lowering maintenance and restoration costs for all customers.

Criteria for consideration in the selection of targeted communities include:

- Performance of overhead lines
- Age of assets
- Service location (e.g., lines located in backyard where accessibility is limited)
- Vegetation impacts (e.g., heavily vegetated and often costly and difficult to trim)



Backlot Distribution Lines

3-Year Scope *(Targeted Undergrounding)*

	Duke Energy Carolinas			Duke Energy Progress		
Targeted UG	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Costs	$5,390,000	$7,315,000	$6,970,000	$1,610,000	$2,185,000	$4,030,000
Approx. Line Miles	11 miles	15 miles	14 miles	4 miles	5 miles	9 miles

Oliver Exhibit 9

2019 Locations *(TUG - Individual, less complex tap lines)*

Year	Jur	Target ID	Neighborhood/Area	Approx. Line Miles	No. of Cust Affected
2019	DEC	38695613	Converse Heights – E Sherwood	0.48	49
2019	DEC	38691449	Gadsden Ct	0.04	8
2019	DEC	38699919	Spartanburg Country Club	0.05	8
2019	DEC	38630077	Piedmont Golf Course Rd	0.04	3
2019	DEC	38695222	Wintergreen Terr	0.41	37
2019	DEC	38699923	Spartanburg Country Club	0.75	10
2019	DEC	38687023	Boys Home Rd	0.16	6
2019	DEC	38687335	Hunter Philson Ln	0.31	23
2019	DEC	38687470	Huntington Dr.	0.21	19
2019	DEC	38687473	W Croft Cir	0.21	17
2019	DEC	38696348	Church Ln	0.53	17
2019	DEC	38703423	Drayton Rd	0.05	11
2019	DEC	38710584	Chigger Creek Rd	0.24	7
2019	DEC	38684637	W Hampton Ave	0.12	69
2019	DEC	38692469	Horseshoe St	0.06	1
2019	DEP	427934240	Frank Clarke St	0.17	15
2019	DEP	43081499	Warley St	0.38	49

2019 Locations *(TUG - Neighborhoods or logical groupings* justified by cost benefit analysis*)*

Year	Jur	Target ID	Neighborhood/Area	Approx. Line Miles	No. of Cust Affected
2019	DEC	38691449	Gadsden Ct	0.04	N/A
2019	DEC	38699919	Spartanburg Country Club	0.05	N/A
2019	DEC	38630077	Piedmont Golf Course Rd	0.04	N/A
2019	DEC	38695222	Wintergreen Terr	0.41	N/A
2019	DEC	38699923	Spartanburg Country Club	0.75	N/A
2019	DEC	38687023	Boys Home Rd	0.16	N/A
2019	DEP	418275689	Gilchrist Road	0.18	66
2019	DEP	429238181	Fulton Avenue	0.18	52
2019	DEP	429238239	Janice Loop	0.15	188
2019	DEP	435219767	Hwy 41	0.10	12
2019	DEP	430802731	Big Swamp Road	0.07	10
2019	DEP	421920381	Sumter Hwy	0.21	34
2019	DEP	424469152	Marshall St	0.07	12
2019	DEP	422458199	Between Parkview and Haven	0.34	325
2019	DEP	422457877	End of Cloverdale	0.07	17
2019	DEP	422458853	Lincoln Avenue	0.15	129
2019	DEP	422459449	Harry Byrd Hwy	0.07	15
2019	DEP	422458594	Burlington Drive	0.13	54
2019	DEP	427934400	S Church Street	0.17	24
2019	DEP	428172386	Marilyn Avenue	0.12	80
2019	DEP	427935316	E Liberty Street	0.19	190
2019	DEP	427935020	Jerry Street	0.14	57
2019	DEP	427934295	Woodland Ct	0.07	46

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Year	Jur	Target ID	Neighborhood/Area	Approx. Line Miles	No. of Cust Affected
2019	DEP	427934720	Woodside Road	0.10	30
2019	DEP	427935372	Pos. loop with ID 428172758	0.14	92
2019	DEP	428172758	Pos. loop with ID 427935372	0.11	66
2019	DEP	427935477	Lawton Circle	0.15	151
2019	DEP	427934989	Hwy 521 S	0.07	8

2020 Locations *(TUG - Individual, less complex tap lines)*

Year	Jur	Target ID	Neighborhood/Area	Approx. Line Miles	No. of Cust Affected
2020	DEC	38684758	Park Hills	5.13	568
2020	DEC	38684799	Cedar Springs	0.57	71
2020	DEC	38660523	Del Norte 2.5	1.15	110
2020	DEC	38685552	Hampton Heights 2.5 (Phase I)	0.84	71
2020	DEC	38698667	Old Georgia Rd	0.68	29
2020	DEC	38687170	Worden Dr	0.57	46
2020	DEC	386895634	Eas0wtood Cir	0.62	36
2020	DEC	38709792	Vineyard Rd	0.66	358
2020	DEC	430800879	Arrowwood	1.1	167
2020	DEP	43081505	Housing Authority	0.5	67
2020	DEP	424469424	Hamden Circle	0.51	26
2020	DEP	424468774	Hall Circle	0.51	17
2020	DEP	429237938	McFarlin St	0.54	72
2020	DEP	424469059	Mimosa Dr	0.88	70

2020 - 2021 Targets *(Neighborhoods or logical groupings* justified by cost benefit analysis*)*

Year	Jur	Target ID	Neighborhood/Area	Approx. Line Miles	No. of Cust Affected
2020-2021	DEC	38640704	Woodside	1.14	155
2020-2021	DEC	38684637	Hampton Heights	3.21	467
2020-2021	DEC	38826214	Chanticleer	4.6	543
2020-2021	DEC	38684758	Park Hills	5.13	568
2020-2021	DEC	38695049	Converse Heights	13.76	190
2020-2021	DEC	38647425	Foxhall Rd	1.48	90
2020-2021	DEC	38657968	Woodlake	1.21	99
2020-2021	DEC	38622352	Independence-Providence	2.94	311
2020-2021	DEC	38660523	Del Norte	5.05	527
2020-2021	DEC	38749601	Merrifield Park	5.51	N/A
2020-2021	DEP	430802772	Alleghany	2.12	370
2020-2021	DEP	430800589	Tara Village	9.43	821
2020-2021	DEP	435201123	Greenwood Park	1.9	142
2020-2021	DEP	427934210	Sherwood Subdivision	2.4	182
2020-2021	DEP	422458455	Yaupon Drive (w/ 422457944)	0.15	N/A
2020-2021	DEP	422457944	Yaupon Drive (w/422458455)	0.40	N/A

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X. Energy Storage

The program supports customer and utility initiatives through smart investments in storage for applications that deliver value to customers and the company. These applications include microgrid projects for preventing planned and unplanned outages, as well as long-duration outage projects for providing redundant power sources for vulnerable (rural and remote) communities, and circuit and bank capacity projects using substation-tied energy storage.

Given the multiple applications energy storage technology supports, projects within the Energy Storage program are designed and assessed on a case-by-case basis for the specific challenge being addressed (e.g., long duration outage support, microgrid or emergency power support, auxiliary service needs, etc.).

The Energy Storage program also includes the development and deployment of an energy storage control system to manage the fleet of energy storage resources.

3-Year Scope *(Energy Storage Management System)*

	Duke Energy Carolinas			Duke Energy Progress		
Energy Storage	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
TOTAL	**$281,000**	**$45,000**	**$16,045,000**	**$84,000**	**$13,000**	**$8,013,000**
Energy Storage Mgmt Sys	$281,000	$45,000	$45,000	$84,000	$13,000	$13,000
Deployment Projects	NA	NA	$16,000,000	NA	NA	$8,000,000
Approx. No. of Sites	NA	NA	3	NA	NA	1

2021 Candidate Locations *(Energy Storage Deployment)*

Capacity Support

Substation	Circuits	No. of Cust
Fants Grove 12KV	1205	865
	1206	1,285
Campton Retail Bank 1	1201	1,429
	1202	1,224
	1203	424
New Prospect Ret	1201	752
	1203	308

Reliability Support

Long Duration/High Impact Site	
Substation	Nichols Substation
Circuit Name	Nichols
5-Year CI	20,649
5-Year CMI	25,943,310
Peak Load	7.7 Megawatts
No. of Cust	1,331

Oliver Exhibit 9

XI. Long Duration Interruptions / High Impact Sites

The Long Duration Interruption / High Impact Sites (LDI/HIS) program is designed to improve the reliability in parts of the grid where the duration of potential outages is expected to be much higher than average. Focus areas for this program are radial feeds to entire communities or large groups of customers as well as inaccessible line segments (i.e. off road, swamps, mountain gorges, extreme terrain, etc.).

Many of the areas served by these long, rural, single-sourced feeders can experience significant impacts to the local economy and to quality of life when the entire town loses power. Further, operational and repair costs are generally higher than average in these areas due to the special equipment required.

While some sites may include extreme hardening, circuit relocations, new circuit ties and undergrounding, energy storage solutions may offer more cost-effective solutions for improving reliability and managing costs.

The LDS/HIS program is designed to improve the reliability of high- impact customers like airports and hospitals, and high-density areas that could require a variety of infrastructure solutions to improve power quality and reliability. Typical projects include substation upgrades, circuit ties, voltage conversions, and reconductoring.

3-Year Scope *(Long Duration Interruptions / High Impact Sites)*

	Duke Energy Carolinas			Duke Energy Progress		
LDI / HIS	2019	2020	2021	2019	2020	2021
Costs	$5,267,000	$7,700,000	$0	$1,573,000	$2,300,000	$6,000,000

2019-2021 Candidate Locations *(Long Duration Interruptions / High Impact Sites)*

Year	Jur	Location	LDI / HIS Project Scope
2019	DEC	Greenville Memorial Hospital, SC	Relocate & upgrade live front switchgear to dead front. Install automatic throw over PME-10 with communications. Install concrete encased duct with manholes for 1/0 loops.
2019	DEC	Welpine Rd, Pendleton, SC	Build tie between sandy springs 1203 and Whitehall 1203 and reconductor 3-phase to approx. 1.7 miles.
2019	DEC	Anderson, SC	Re-conductor and build tie point between Whitehall 1203 & hurricane creek 1203
2019	DEC	Centerville Rd. & Mount Tabor Rd., Anderson, SC	Build single phase tie between Fants Grove 1206 & 1205 @. to relieve load off 1206 single phase tap
2019	DEC	Stone Station Dr., Roebuck, SC	Create circuit tie between Camp Croft 1206 and Moore 1201. Starting Fac. ID-35842833 Ending Fac. ID- 39908248
2019	DEC	Hwy 702, Ninety-Six, SC	Reconductor 3.8 miles of 1PH to 3PH 556 AAC and create a circuit tie between Eddy Rd. 1202 and Panaroma 1202

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Year	Jur	Location	LDI / HIS Project Scope
2019	DEC	Waddell Rd & Greenpond Rd, Woodruff, SC	Reconductor 2PH to 3PH and create circuit tie with Moore circuit.
2019-2021	DEP	Aynor, SC	Build New interconnection with local co-op at their sub near Aynor, or build new small substation in Aynor area
2019-2021	DEP	U.S. Hwy 1, Cheraw, SC	Part 1: Rebuild & relocate PEE DEE river xing on State Rd. and Cheraw City feeders. Inaccessible
2019-2021	DEP	U.S. Hwy 1, Cheraw, SC	Part 2: Rebuild & Relocate PEE DEE river xing on State Rd. and Cheraw City feeders. Inaccessible
2020-2021	DEC	Hwy 101, Woodruff, SC	Reconductor/rebuild 1PH to 3PH w/ 336. Need to obtain R/W to extend 3ph along road to other existing OH facilities.
2020-2021	DEC	Hwy 221, Woodruff, SC Near Three Pines Country Club	Relocate and rebuild 3 miles that feeds backline out to Hwy 221. Reconductor with 556. This can be used as a circuit tie with Moore 1202 Fac. ID of Wire-35866231
2020	DEC	Hwy 418, Border of Woodruff & Fountain Inn, SC	Create circuit tie between Woodruff 1202 and Scuffle Town 1203 along Hwy 418 Starting Fac. ID- 38937603 Ending Fac. ID-37485093
2020	DEC	Hwy 221, Moore, SC	Relocate 3 phase recloser feeder from backline out to road. 6300'. Reconduct with 556. Fac. ID 39002200 Fac. ID-35875162
2020-2021	DEC	Boiling Springs Rd, Greer, SC	Build a circuit tie between Roper Mtn. 1211 and Hightower 1209. Will need to obtain a joint use with Laurens Electric.
2020	DEC	South Port Rd near Hwy 9, Pacolet, SC	Create a circuit tie between Camp Croft 1209 and 1211. Re-conduct 1PH to 3PH between FID 35695465 AND 35884318. Build new from 35884318 to 37470518.
2020	DEC	Meyers Dr, Greenville, SC	Brushy Creek 1211 - Need to convert 1ph OH to 3ph OH from Facid# 39044098 to Facid# 386248815. Will need to obtain R/W to build in one section of wire. Need to remove existing UG risers @ each pole.
2020	DEC	Civic Center of Anderson, SC	Microgrid optimization design
2020	DEC	Fountain Inn, SC	Complete radial run of primary between a 2500 and a 1500 kva tx and make loop
2020	DEC	Fountain Inn, SC	Complete the loop of this radial between the 2 2500KVA tx's.
2020	DEC	Fountain Inn, SC	Complete radial run of UG between 2 2500 kva tx's. w/ loop
2020	DEC	McFarland Rd, York, SC	Build Circuit Tie on single phase line
2020	DEC	Hwy 49, York, SC	25 Spruce St / HWY 49 FROM YORK TO SHARON /York 1209 & Sharon Grove 1202 circuit tie - Hwy 49
2020	DEC	Tega Cay, SC	Convert 3200' double circuit backbone from OH to 1000 MCM UG cable. Install 6 switchgear to segment.
2021	DEP	Manning, SC	T3965B02---Pinewood Paxville FDR---relocate OH single phase primary line out of the woods to edge of the paved road. The length is approx. 1500' at a cost of $43,500.
2021	DEP	Greeleyville, SC	T2930B04 / Kingstree Central Fdr. Relocate lines from DIS# CL41BQ--CM4BQ to the road including taps. Install 477aaac. Repl. SBD @ CL19BQ w/ 600 amp switches feeding towards CR18BQ. Rem. SBD @ CR18BQ. Install 600 amp switches @ CM4BQ. Tap at main road to change feed to CL83BQ
2021	DEP	Greeleyville, SC	T2930b04 / Kingstree central/ relocate three phase line to the road from dis# 6px52 - 7h782… 2890'

Oliver Exhibit 9

XII. Enterprise Communications

The Enterprise Communications program addresses technology obsolescence, secures vulnerabilities, and provides new workforce-enabling capabilities. This program includes improvement and expansion of the entire communications network from the high-speed, high-capacity backbone fiber optic and microwave networks to the wireless connections at the edge of the grid. These upgrades help build the secure communications required for the increasing number of smart components, sensors, and remotely activated devices on the transmission and distribution systems.

Communication Tower and Comm Device

Key communication efforts are: (1) **Mission Critical Transport** which strategically upgrades the infrastructure required for high-speed, reliable, sustainable, interoperable communications for grid devices and personnel; (2) **Grid Wide Area Network** (Grid WAN) which improves network reliability, performance and security for current grid management/control applications; (3) **Mission Critical Voice** which replaces current Land Mobile Radio systems with enhanced, reliable, sustainable, interoperable communications across all service territories; and (4) **Next Generation Cellular** which replaces obsolete 2G/3G cellular technology with the more reliable and secure 4G/5G technology required for modern grid devices in the field.

3-Year Scope (Enterprise Communications)

	Duke Energy Carolinas			Duke Energy Progress		
Enterprise Comm (SC)	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
TOTAL	**$5,232,000**	**$9,754,000**	**$10,296,000**	**$2,550,000**	**$7,810,000**	**$5,374,000**
Next Generation Cellular	$516,781	$210,568	$205,122	$65,126	$274,876	$252,137
Mission Critical Voice	$250,091	$2,440,841	$1,340,132	$53,437	$1,776,412	$640,726
BizWAN	-	$40,073	$47,862	-	$46,748	$35,596
GridWAN	$489,116	$1,441,189	$1,791,400	$716,391	$1,911,046	$1,489,094
Mission Critical Transport	$1,393,982	$4,778,875	$6,057,514	$303,923	$2,690,610	$2,146,727
Towers Shelters Pow Sup	$1,452,964	$643,362	$757,243	$1,177,870	$966,742	$762,345
Network Asset Systems	-	$62,660	$96,578	-	$44,878	$47,461
Vehicle Area Network	$1,129,505	$136,541	-	$233,203	$98,357	-

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2019 *(Enterprise Communications)*

Enterprise Communications	DEC	DEP	
TOTAL	$5,232,000	2,550,000	
Next Generation Cellular Devices	$517,000 596	$65,000 127	Replaces obsolete 2G/3G cellular modems with 4G/5G modems for grid devices
Mission Critical Voice	$250,000	$53,000	Begin replacement for land mobile radio system
BizWan	$ -	$ -	Update data network architecture to improve reliability and performance
GridWAN Sites	$449,000 12	$716,000 3	Improve network reliability, performance and security for current grid management/control applications (e.g., control/data centers, substations or shelter sites)
Mission Critical Transport Approx. Miles	$1,394,000 7	$304,000 1	Replacement and expansion of existing communications transport network infrastructure such as fiber (overhead and underground), microwave, optical and cambium.
Towers Shelters Power Supplies Sites	$1,453,000 3	$1,179,000 1	Replacement and expansion of communication towers, as well as shelters and power supplies at tower locations
Network Asset Systems	--	--	Adds the tools needed to test, monitor and manage grid communications assets and systems
Vehicle Area Network (VAN) Vehicles	$1,030,000 2658	$233,000 551	Installation of vehicle mounted device to implement a vehicle area network

2020 *(Enterprise Communications)*

Enterprise Communications	DEC	DEP	
TOTAL	$9,754,000	$7,810,000	
Next Generation Cellular Devices	$211,000 347	$275,000 232	Replaces obsolete 2G/3G cellular modems with 4G/5G modems for grid devices
Mission Critical Voice	$2,441,000	$1,776,000	Begin replacement for land mobile radio system
BizWan	$40,000	$47,000	Update data network architecture to improve reliability and performance
GridWAN Sites	$1,441,000 18	$1,911,000 13	Improve network reliability, performance and security for current grid management/control applications (e.g., control/data centers, substations or shelter sites)
Mission Critical Transport Approx. Miles	$4,779,000 23	$2,691,000 16	Replacement and expansion of existing communications transport network infrastructure such as fiber (overhead and underground), microwave, optical and cambium.
Towers Shelters Power Supplies Sites	$643,000 1	$967,000 1	Replacement and expansion of communication towers, as well as shelters and power supplies at tower locations
Network Asset Systems	$63,000	$45,000	Adds the tools needed to test, monitor and manage grid communications assets and systems
Vehicle Area Network (VAN) Vehicles	$137,000 321	$98,000 232	Installation of vehicle mounted device to implement a vehicle area network

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2021 *(Enterprise Communications)*

Enterprise Communications	DEC	DEP	
TOTAL	**$10,296,000**	**$5,374,000**	
Next Generation Cellular Devices	$205,000 321	$252,000 170	Replaces obsolete 2G/3G cellular modems with 4G/5G modems for grid devices
Mission Critical Voice	$1,340,000	$641,000	Begin replacement for land mobile radio system
BizWan	$48,000	$36,000	Update data network architecture to improve reliability and performance
GridWAN Sites	$1,791,000 22	$1,489,000 11	Improve network reliability, performance and security for current grid management/control applications (e.g., control/data centers, substations or shelter sites)
Mission Critical Transport Approx. Miles	$6,057,000 29	$2,147,000 14	Replacement and expansion of existing communications transport network infrastructure such as fiber (overhead and underground), microwave, optical and cambium.
Towers Shelters Power Supplies Sites	$757,000 1	$762,000 1	Replacement and expansion of communication towers, as well as shelters and power supplies at tower locations
Network Asset Systems	$97,000	$47,000	Adds the tools needed to test, monitor and manage grid communications assets and systems
Vehicle Area Network (VAN) Vehicles	-- --	-- --	Installation of vehicle mounted device to implement a vehicle area network

Oliver Exhibit 9

XIII. Distribution Automation

The capabilities offered through Distribution Automation (DA) can transform what may have been an hour-long power outage for hundreds or even thousands of homes and businesses into a momentary outage – or potentially help avoid an outage altogether.

The DA program consists of several complementary efforts that work in concert to support dynamic and growing distribution system loads in a more sustainable way while minimizing power quality issues that often accompany a large-scale transition to solar power. One of these projects, **Underground System Automation**, modernizes the protection and control of underground power systems that serve critical high-density areas, such as urban business districts and airports.

The **Fuse Replacement** project focuses on replacing one-time use fuses with automatic operating devices capable of intelligently resetting themselves for reuse, thus eliminating unnecessary use of resources (inventory, time, gasoline, etc.). The **Hydraulic to Electronic Recloser** program replaces obsolete oil-filled (hydraulic) devices with modern, remotely operated reclosing devices that support continuous system health monitoring.

Such digital device upgrades offer further value through efforts like the **System Intelligence and Monitoring** pilot, which develops advanced diagnostic tools that help engineers and technicians address electrical disturbances on the distribution system and improve customer experience.

3-Year Scope *(Distribution Automation)*

	Duke Energy Carolinas			Duke Energy Progress		
Distribution Automation	2019	2020	2021	2019	2020	2021
TOTAL	**$3,957,000**	**$7,155,000**	**$7,937,000**	**$1,139,000**	**$2,420,000**	**$2,909,000**
Hydraulic to Elec Recloser	$2,772,000	$5,000,000	$5,160,000	$828,000	$1,615,000	$1,840,000
Approx. No. of Units	*42*	*76*	*79*	*13*	*26*	*29*
Sys Intel and Monitoring	$415,000	$385,000	$497,000	$81,000	$115,000	$149,000
Fuse Replacement	--	$1,000,000	$1,510,000	--	$460,000	$690,000
Substations	--	1	2	--	1	1
UG Sys Automation	$770,000	$770,000	$770,000	$230,000	$230,000	$230,000

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HYDRAULIC TO ELECTRONIC RECLOSER REPLACEMENT

2019 Locations *(Hydraulic to Electronic Recloser Replacement)*

SOUTH CAROLINA DEC

Service Area	WO #	County
SMPCD	27656660	Greenville
ANDCD	10135819	Anderson
CHSCD	21369666	Chester
LANCD	21370078	Lancaster
YRKCD	21370320	York
YRKCD	22491598	York
YRKCD	21368225	York
TVRCD	28502024	Greenville
CLECD	28502007	Pickens
CLECD	28502008	Pickens
ANDCD	28813646	Anderson
ANDCD	28813693	Anderson
DUNCD	21294803	Spartanburg
SMPCD	21288526	Spartanburg
TVRCD	21289652	Greenville
TVRCD	21289978	Greenville
TVRCD	21290455	Greenville
TVRCD	21290526	Greenville
CLECD	21301652	Anderson
CLECD	21301565	Pickens
CLECD	21301531	Pickens
GRNCD	21289593	Anderson
GRNCD	21289857	Greenville
GRNCD	21290124	Anderson
SPTCD	21291183	Spartanburg
SPTCD	21294658	Spartanburg
SPTCD	21294479	Spartanburg
SPTCD	21294067	Spartanburg
SPTCD	21294523	Cherokee
ANDCD	21301716	Anderson
ANDCD	21301679	Anderson
GRNCD	26446436	Pickens

SOUTH CAROLINA DEP

Service Area	WO #	County
FLRNC	28570606	Florence
FLRNC	28570535	Florence
KINGS	27310471	Georgetown
KINGS	27310609	Georgetown
KINGS	26865655	Williamsburg
MRNCY	25011345	Dillon
MRNCY	25011346	Dillon
MRNCY	27226800	Dillon
HRTSV	25032975	Lee
HRTSV	25034611	Lee
HRTSV	25032974	Lee
HRTSV	25033864	Lee
SUMTR	29121192	Sumter
SUMTR	29121037	Sumter
SUMTR	28515192	Sumter
SUMTR	28106004	Sumter
SUMTR	28515947	Sumter
SUMTR	27408337	Sumter
SUMTR	28519312	Sumter
SUMTR	28525762	Sumter

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2020-2021 DEC Locations *(Hydraulic to Electronic Recloser Replacement)*

Recloser ID	Circuit ID	Rating (Amps)
39011377	02031203	200
39000781	02031206	200
39006892	02051205	200
404842661	02051206	200
88164672	02051209	200
357531696	02051209	140
39005392	02051210	140
123046773	02071203	200
39000912	02071204	200
88376073	02081209	140
39011878	02081211	200
39011895	02081211	200
39005674	02091209	200
39000852	02091211	200
39000884	02091212	140
39009297	02121203	200
39011794	02121203	200
39007928	02121205	200
39011251	02131204	200
456237578	02131204	200
456237590	02131204	200
39001019	02131206	140
39005156	02131206	140
39001053	02131208	140
39009884	02131210	140
39009888	02131210	140
39011468	02131210	140
39001075	02171203	140
39005089	02171203	140
39000880	02191205	140
39001071	02211201	200
39004646	02211201	140
39004650	02211201	140
39004807	02211202	200
39004811	02211202	140
112911459	02231205	200
39001007	02271202	200
84316984	02271204	200
405787795	02271204	200
410927269	02271204	200
39004751	02311204	140
50467919	02311204	140
367253160	02321208	200

Recloser ID	Circuit ID	Rating (Amps)
39005576	02331205	200
39000840	02331206	200
39011418	02331206	200
107815374	02331207	200
84617638	02351207	200
39008748	02351208	200
39008752	02351208	200
39000955	02351209	200
39000959	02351209	200
39008260	02351214	200
39001043	02391201	140
362564198	02391201	200
39004755	02391202	140
39006215	02391202	140
39011874	02431206	200
39000888	02431210	200
39000892	02431210	200
39000904	02431210	200
39000916	02431210	140
39000856	02431212	200
39011759	02431212	140
39000966	02441205	200
391664332	02461205	200
52258549	02461206	140
39011846	02461208	200
39001079	02461210	200
85219173	02461210	200
88325300	02461210	200
39000789	02471201	140
456065861	02471201	200
39000821	02471202	200
85497991	02491205	200
39000876	02511201	200
392974522	02511201	200
455709430	02511201	200
39007108	02521210	200
39007112	02521210	200
39001011	02531204	200
39005749	02531204	140
39005760	02531204	140
39000983	02531205	140
39001023	02531205	200
39008026	02531208	200

Recloser ID	Circuit ID	Rating (Amps)
356192218	02551212	140
43090427	02581204	200
39000860	02611201	140
39000896	02611203	200
39007222	02611203	140
39011790	02651206	200
39005678	02651207	200
120155776	02651207	200
39008744	02651211	200
39008740	02651216	200
39005093	02671201	140
39006474	02671202	200
39000974	02671203	200
39005047	02671203	140
39009437	02821206	200
39005580	02821207	200
39005753	02821208	200
39009038	02821208	200
39000793	02821209	200
39000817	02821209	140
39000951	02841202	200
411000255	02841204	140
411000259	02841204	140
39000908	02841205	200
39008447	02841206	200
49540702	02841206	200
198318390	02841210	200
39008264	02841212	140
355840212	02851204	200
39000121	04011203	140
39000125	04011203	140
39000133	04011205	200
39000141	04011205	140
39011621	04011205	200
39000158	04011206	200
39007417	04011206	140
39000166	04021201	140
39000176	04021201	140
356295319	04021203	200
39000197	04031201	140
39000208	04031201	140
39000216	04031201	140
39005728	04031202	140

Recloser ID	Circuit ID	Rating (Amps)
39005945	04031203	140
39007682	04111201	200
39007686	04111201	200
39000210	04141201	140
39000271	04141202	140
39000372	04151201	140
39000393	04151201	200
102833578	04171203	140
39000721	04171204	200
39000570	04181205	200
39009046	04181208	200
39000674	04181209	200
84407862	04181209	200
39000253	04201202	200
39000257	04201202	140
39000310	04201202	140
39007226	04201202	140
39000376	04201203	140
39000397	04201203	140
165869119	04221204	140
39005550	04231205	200
39005572	02331205	140
39008732	02551212	200
39000325	04031203	200

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Hydraulic Recloser


3-Phase Electric Recloser

2020-2021 DEP Locations *(Hydraulic to Electronic Recloser Replacement)*

Recloser ID	Circuit ID	Rating (Amps)
ET57BQ	T2890B02	RC4E1402A2BC
AM29BX	T3750B01	RC4E1402A2BC
1BNJ42	T2825B01	RC4E1402A2BC
XP253	T2930B04	RC4E1402A2BC
XCL57	T3005B02	RC4E1402A2BC
FM52BW	T3665B05	RC4E1402A2BC
XBQ67	T3005B05	RC4E1402A2BC
YH27BM	T2824B02	RC4E1402A2BC
GR34BV	T3760B01	RC4E1402A2CC
15AD34	T3985B01	RC4E1402A2CC
18HX64	T3391B01	RC4E1402A2CC
JG84BT	T3391B01	RC4E1402A2CC
QC78BS	T3035B01	RC4E1402A2CC
X2070	T2745B01	RC4E1002A2BC
1BMP45	T2750B02	RC4E1002A2BC
HR90BM	T2822B01	RC4E1002A2BC
DS54BM	T2824B04	RC4E1002A2BC
XB405	T2825B01	RC4E1002A2BC
U42BM	T2835B01	RC4E1002A2BC
DS30BQ	T2890B01	RC4E1002A2BC
EB32BQ	T2890B01	RC4E1002A2BC
141C61	T2890B02	RC4E1002A2BC
BY65BQ	T2930B02	RC4E1002A2BC
R31BQ	T2930B03	RC4E1002A2BC
R44BR	T2950B03	RC4E1002A2BC
1BWB37	T3030B01	RC4E1002A2BC
BV3BS	T3035B01	RC4E1002A2BC
BK33BR	T3040B01	RC4E1002A2BC

Recloser ID	Circuit ID	Rating (Amps)
1AYJ42	T3040B02	RC4E1002A2BC
190C61	T3040B02	RC4E1002A2BC
CP12BM	T3107B11	RC4E1002A2BC
EL96BM	T3107B13	RC4E1002A2BC
HA35BV	T3320B03	RC4E1002A2BC
AE59BU	T3350B01	RC4E1002A2BC
AA50BU	T3350B01	RC4E1002A2BC
CR88BU	T3360B02	RC4E1002A2BC
DW50BU	T3360B02	RC4E1002A2BC
BZ65BV	T3460B01	RC4E1002A2BC
CA79BV	T3460B01	RC4E1002A2BC
BW99BV	T3460B01	RC4E1002A2BC
CF78BT	T3550B01	RC4E1002A2BC
X77BW	T3665B03	RC4E1002A2BC
FW81BW	T3665B05	RC4E1002A2BC
JK72BW	T3680B13	RC4E1002A2BC
15RD96	T3680B14	RC4E1002A2BC
AF04BX	T3750B02	RC4E1002A2BC
FA02BV	T3760B02	RC4E1002A2BC
HX35BV	T3800B02	RC4E1002A2BC
FG61BT	T3890B03	RC4E1002A2BC
FW15BT	T3890B03	RC4E1002A2BC
K40BW	T3910B02	RC4E1002A2BC
BE37BX	T3965B01	RC4E1002A2BC
STR42	T3980B04	RC4E1002A2BC
8A140	T3985B01	RC4E1002A2BC
SBY64	T4000B20	RC4E1002A2BC
SDK65	T4000B24	RC4E1002A2BC

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SYSTEM INTELLIGENCE & MONITORING

2019 Candidate Location *(System Intelligence & Monitoring)*

- Circuit ID 02581203 Scuffletown Ret 1203 (Proof of Concept)

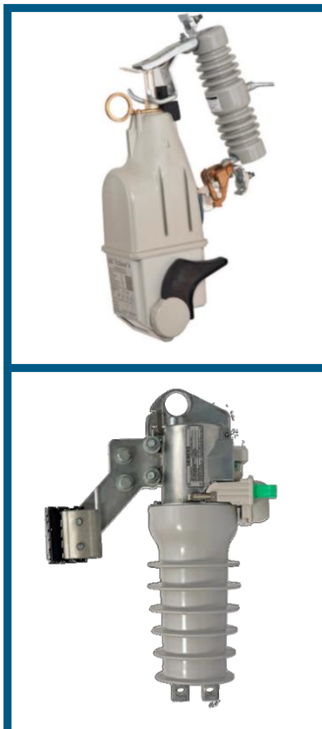
2020 - 2021 Locations *(System Intelligence & Monitoring)*

- The 2020 and 2021 project locations will be selected by mid-2019.

FUSE REPLACEMENTS WITH ELECTRONIC RECLOSERS

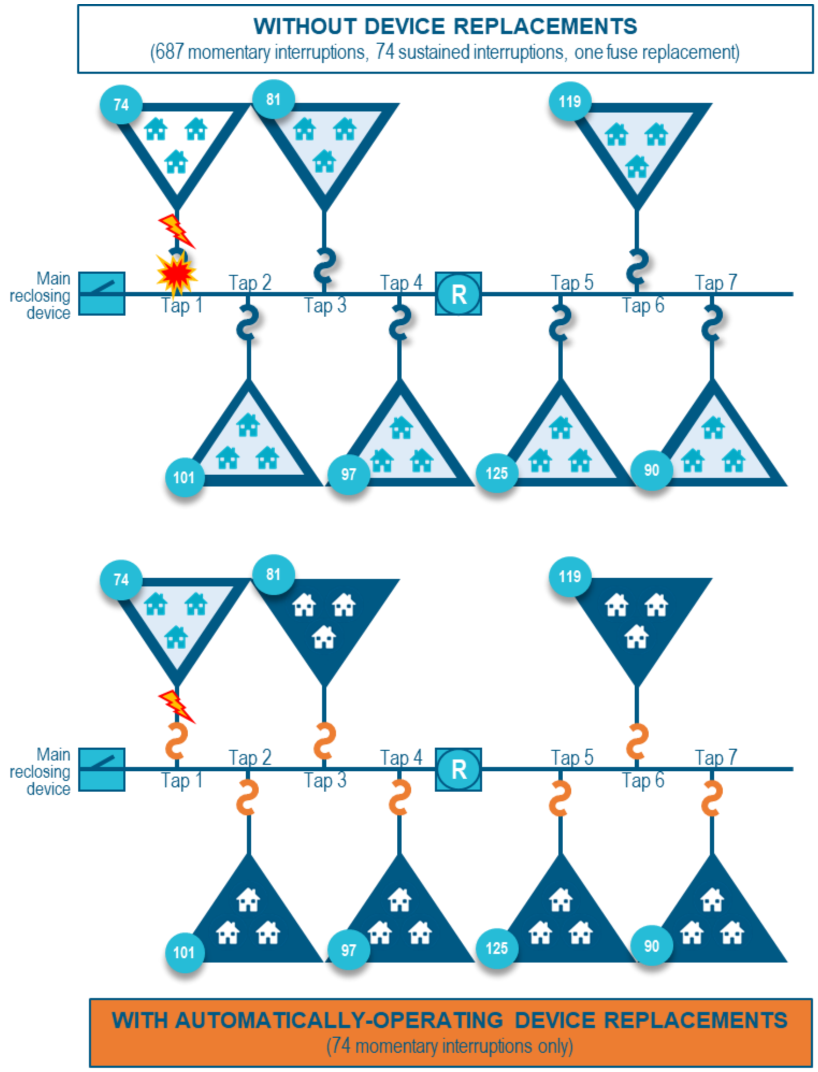
2020-2021 Locations *(Fuse Tap Replacement Electronic Recloser)*

These initial substations are locations where the protective coordination constraints make it likely that a fuse will operate and cause a sustained outage even for a temporary fault condition. Additionally, each of these substations serves a hospital which can be sensitive to even momentary power interruptions. By replacing fuses with small electronic reclosers we introduce targeted momentary interruptions with the intent of reducing sustained interruptions. By targeting these momentary interruptions to the affected lateral, customers on other laterals or sensitive customers on the circuit main line will not be interrupted, even briefly.

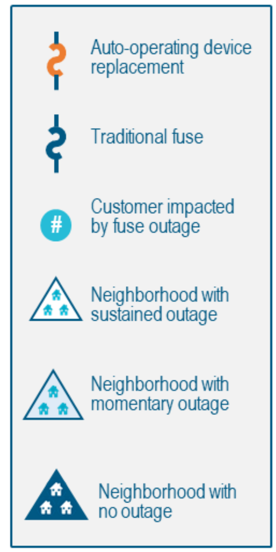


Electronic Reclosers

Tap Fuse Replacement	2019	2020	2021
DEC Sites (Substations)	--		
• Compton Retail	--	175	--
• Conway Retail	--	25	125
• Pelham Retail	--	--	150
DEP Sites (Substations)	--	1	1
• Florence Mt. Hope	--	92	53
• Florence	--	--	145



- Temporary fault Tap 1
- Main reclosing devices blinks
- All **687** customers experience a **momentary outage**
- The **74** customers of neighborhood 1 experience a **sustained outage** until the Tap 1 fuse is replaced



- Temporary fault Tap 1
- Main reclosing devices blinks
- Only the **74** customers experience a **momentary outage**
- Auto-operating device resets
- **Zero sustained outages**; no fuse replacement needed

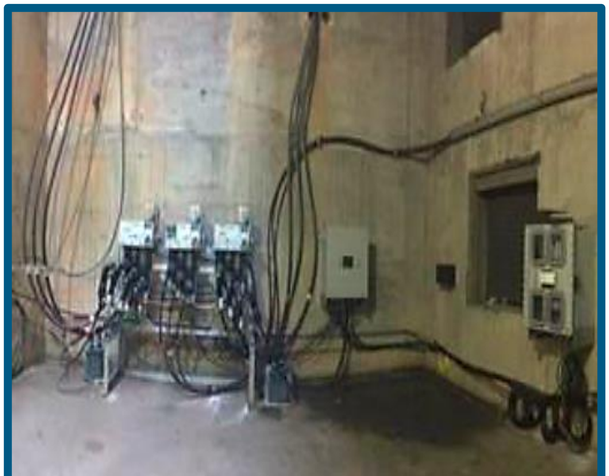
Oliver Exhibit 9

UNDERGROUND (UG) SYSTEM AUTOMATION

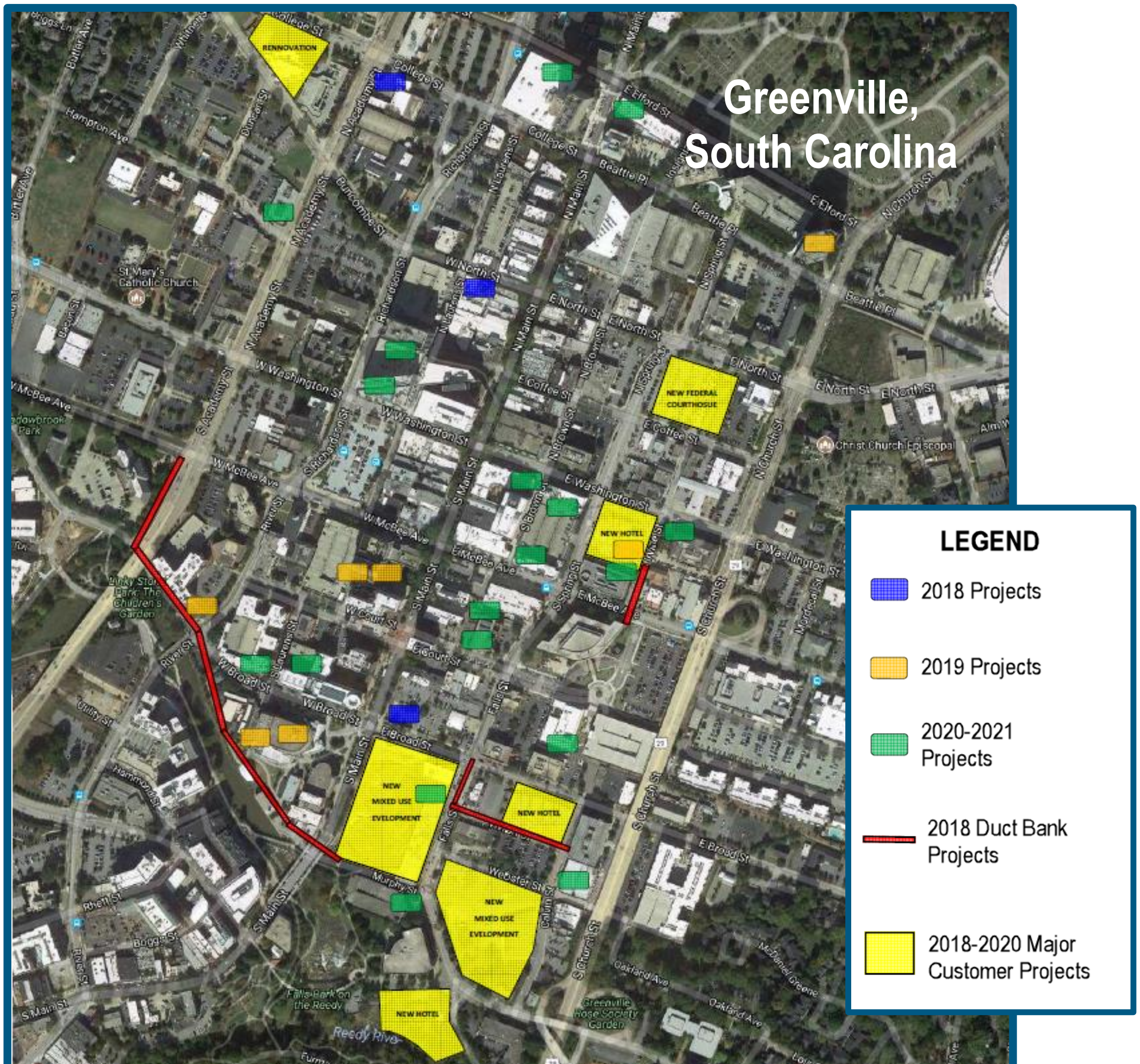
DEC Locations *(Underground System Automation)*

Year	Location	Project Scope
2019	Vault 17	Automation & Comm Deployment
2019	Vault 14	Automation & Comm Deployment
2019	Vault 54	Automation & Comm Deployment
2019	Vault 52A	Automation & Comm Deployment
2019	Vault 52B	Automation & Comm Deployment
2019	Vault 65	Automation & Comm Deployment
2020-2021	Vault 58	Automation & Comm Deployment
2020-2021	Vault 61A	Automation & Comm Deployment
2020-2021	Vault 61B	Automation & Comm Deployment
2020-2021	Vault 22	Automation & Comm Deployment
2020-2021	Vault 28	Automation & Comm Deployment
2020-2021	Vault 38	Automation & Comm Deployment
2020-2021	Vault 45	Automation & Comm Deployment
2020-2021	Vault 51	Automation & Comm Deployment
2020-2021	Vault 66	Automation & Comm Deployment
2020-2021	Vault 68	Automation & Comm Deployment
2020-2021	Vault 69	Automation & Comm Deployment
2020-2021	Vault 10	Automation & Comm Deployment
2020-2021	Vault 5	Automation & Comm Deployment
2020-2021	Vault 67	Automation & Comm Deployment
2020-2021	Vault 87	Automation & Comm Deployment
2020-2021	Vault 88	Automation & Comm Deployment
2020-2021	Vault 90	Automation & Comm Deployment
2020-2021	Vault 3	Automation & Comm Deployment
2020-2021	Vault 40	Automation & Comm Deployment
2020-2021	Vault 13	Automation & Comm Deployment
2020-2021	Vault 21	Automation & Comm Deployment
2020-2021	Vault 43	Automation & Comm Deployment

Pad-Mount Automatic Throw Over Switchgear



Vacuum Operated Self-Healing Loop Switchgear



GREENVILLE URBAN UNDERGROUND AUTOMATION PROJECTS

Oliver Exhibit 9

XIV. Enterprise Applications

Upgrades to existing Enterprise Applications enable system optimization and overall better system performance. Within the program, there are two main components responsible for the delivery of enterprise technology solutions that support transmission, distribution, and other critical lines of business: (1) Enterprise Systems and (2) Grid Analytics.

This effort focuses on delivering transformative, cross-functional technical solutions to the enterprise in non-disruptive ways. Elements within the portfolio include the **Integrated Tools for Outage Applications** (iTOA), which works to drive standardization and coordination of grid control center tools and the **Targeted Undergrounding (TUG) System**, which facilitates efficient workflows via asset management and mapping system upgrades.

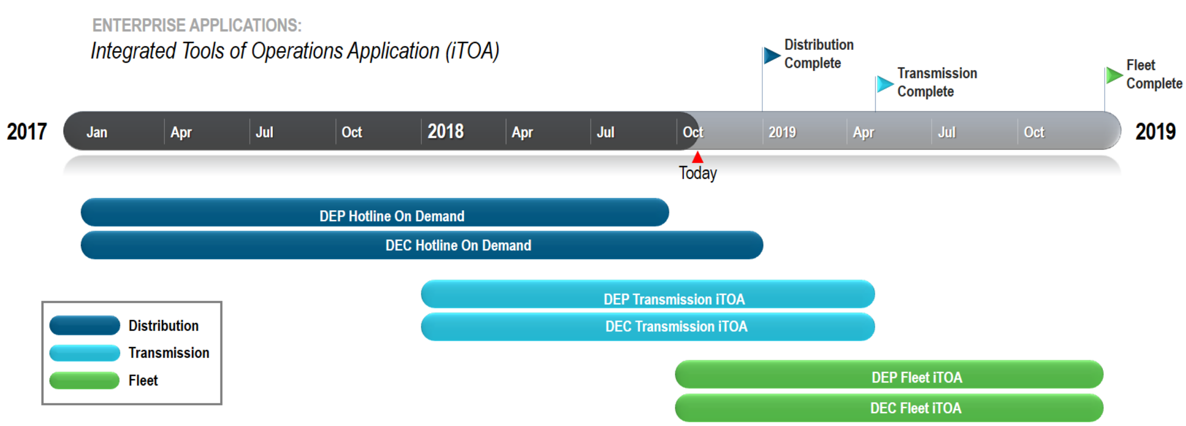
Grid Analytics optimizes the electric system health and performance through the deployment of the **Health Risk Management** (HRM) tool and **Enterprise Distribution System Health** (EDSH) tool. These tools help to prevent equipment failures and improve asset performance on the transmission and distribution systems, respectively.

3-Year Scope *(Enterprise Applications)*

The SC specific detailed implementation plan for 2019 – 2021 is as follows.

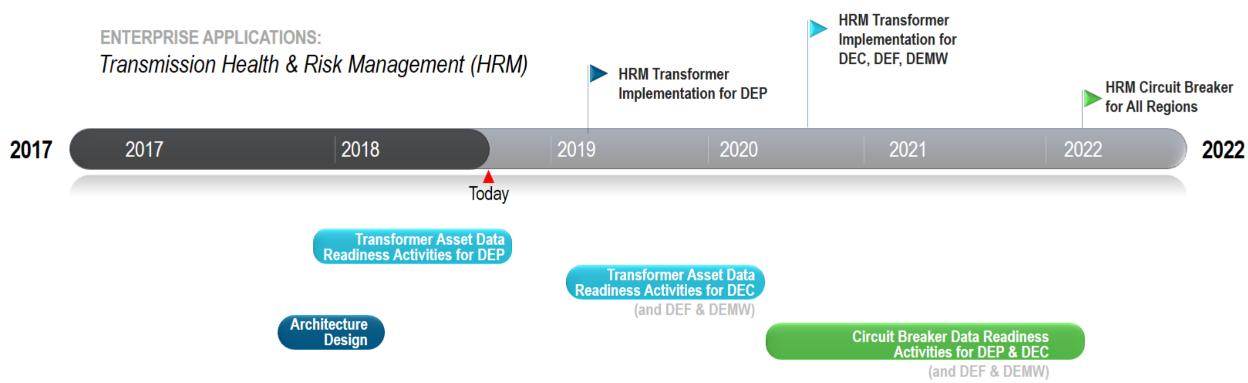
	Duke Energy Carolinas			Duke Energy Progress		
Enterprise Applications	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
TOTAL	**$1,575,000**	**$1,906,000**	**$1,865,000**	**$436,000**	**$847,000**	**$826,000**
Int Tools of Ops App (iTOA)	*$387,000*	*$3,000*	--	*$107,000*	*$200*	--
TUG Sys Software Tools	*$44,000*	--	--	*$12,000*	--	--
Health & Risk Mgmt (HRM)	$437,000	$281,000	$228,000	$120,000	$77,000	$63,000
Ent Dist Health Sys (EDSH)	*$26,000*	--	--	*$7,000*	--	--
Future Initiatives	$681,000	$1,622,000	$1,637,000	$190,000	$770,000	$763,000

3-Year Scope *(Integrated Tools for Ops Apps)*

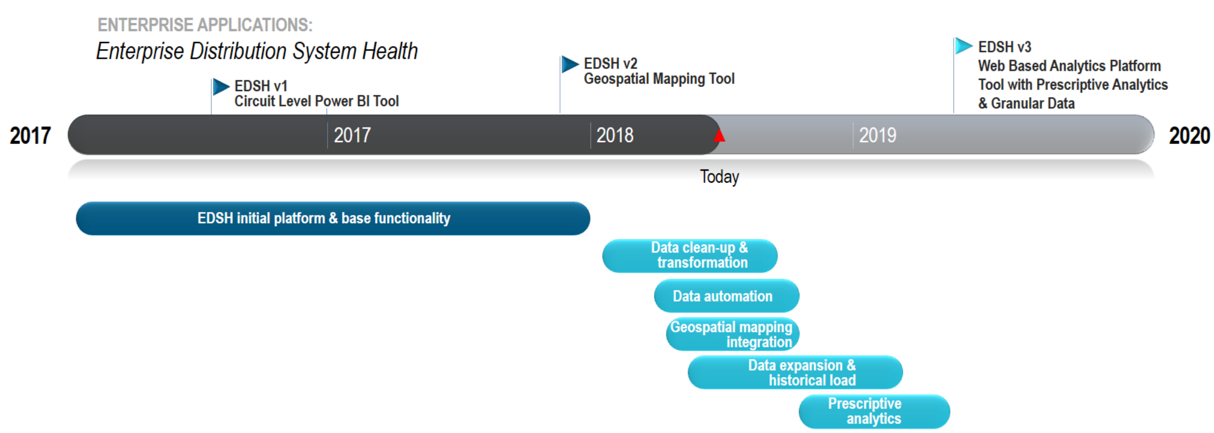


3-Year Scope *(TUG System Software Tools)*

3-Year Scope *(Transmission Health & Risk Management)*



3-Year Scope (*Enterprise Distribution System Health)*



XV. Integrated System Operations Planning (ISOP)

Requirements for modern electric utility systems are evolving rapidly with the advent of emerging new energy technologies, changes in policy, and rapid advancements in information exchange and customer needs. Integrated System Operations Planning (ISOP) focuses on the integration of utility planning disciplines for generation, transmission, distribution and customer programs to improve the valuation and optimization of energy resources across all segments of the utility system to best serve electric customers.

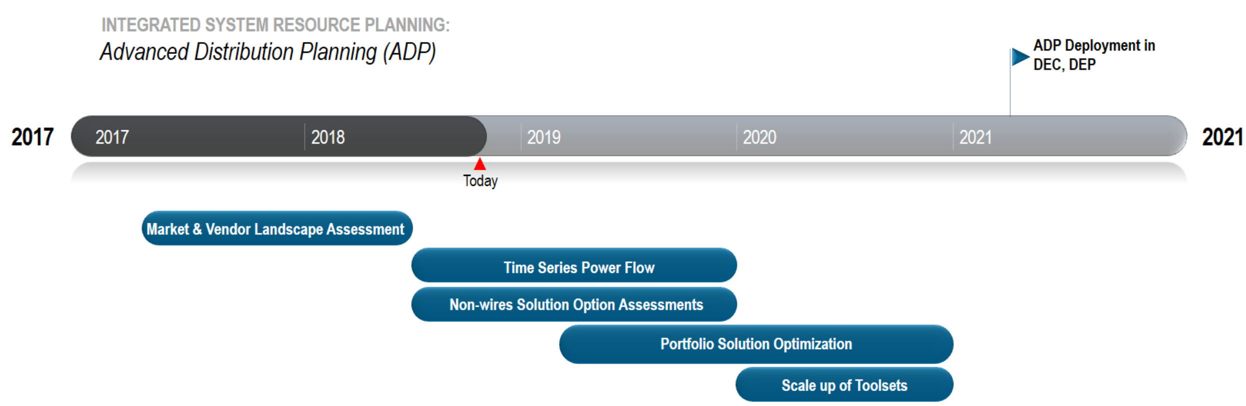
The ISOP process addresses key operational and economic considerations across all segments of the system through integration and refinement of existing system planning tools and, in some cases, development of new analytical tools to assess characteristics that have not historically been captured or considered in long-term planning. Some examples include locational values for distributed resources, system ancillaries and reserves needed to support future operations, and energy resource flexibility to support new dynamic operational demands on the system.

ISOP is a multi-year development program to build the tools, such as the **Advanced Distribution Planning (ADP) Tool**, and related processes needed to accommodate an increasingly integrated approach that will be required to optimize planning and operation of the electric utility system of the future.

3-Year Scope *(Integrated System Operations Planning)*

The South Carolina plan for 2019 – 2021 is as follows.

	Duke Energy Carolinas			Duke Energy Progress		
ISOP	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
TOTAL	**$1,073,000**	**$2,121,000**	**$1,643,000**	**$321,000**	**$634,000**	**$491,000**
Adv Dist Planning Tool	$261,000	$221,000	$63,000	$78,000	$66,000	$18,000
Program Mgmt	$812,000	$1,900,000	$1,580,000	$243,000	$568,000	$473,000



Oliver Exhibit 9

XVI. DER Dispatch Enterprise Tool

This Distributed Energy Resources (DER) Dispatch Enterprise tool will coordinate with the Distribution Management System (DMS) and Energy Management System (EMS) to improve the way DERs are integrated in the energy supply mix, both at the Distribution and the bulk power level.

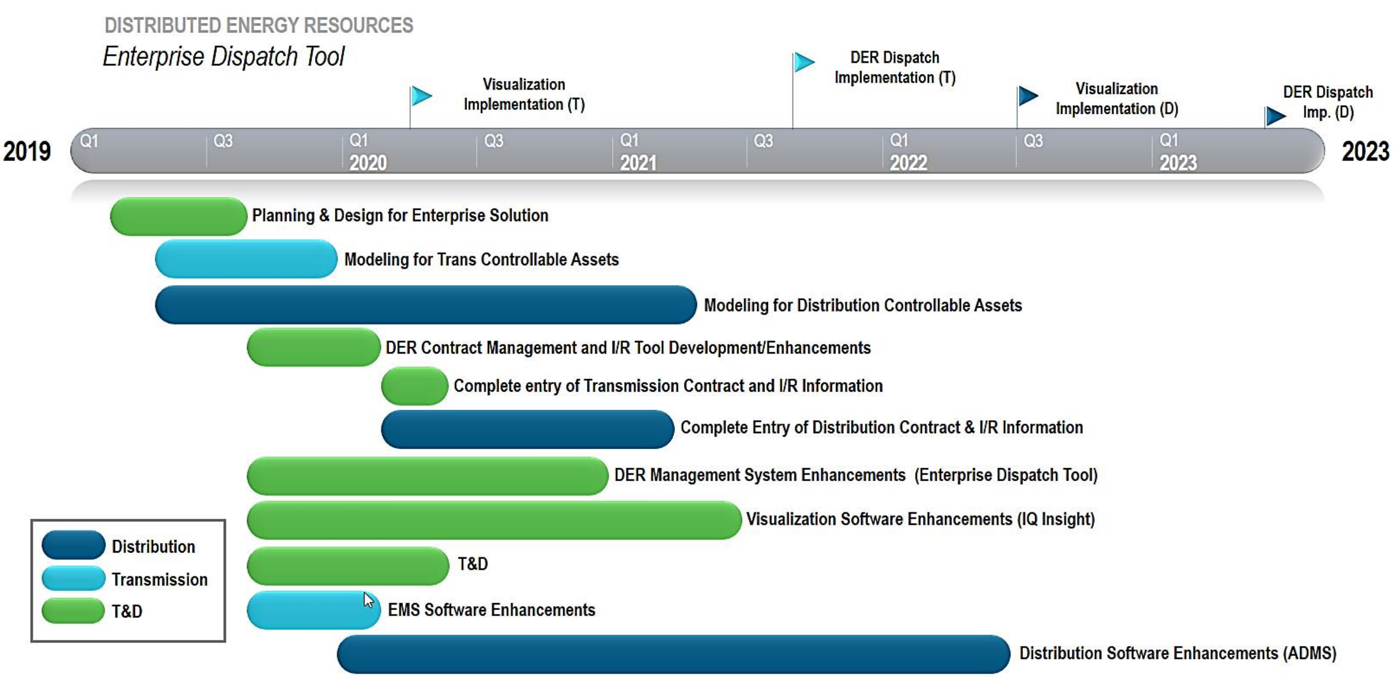
By providing system-wide visualization and control of large-scale DERs, the DER Dispatch Tool will enable system operators to model, forecast, and dispatch a portfolio of distributed energy resources, like solar generation, biofuel generation and energy storage, based on system conditions and real-time customer demand. This tool will help meet the need to match energy demand with supply, especially in emergency conditions.

Current processes and tools provide system operators with a rudimentary ability to quickly shed large blocks of solar generation in emergency conditions to meet standards for real power control (BAL-001-2). The proposed solution will provide operators with a more automated and refined toolset to optimize management of both utility and customer owned DERs to meet system stability requirements.

This system will replace an existing tool in DEP that is used to dispatch distribution connected solar in 50 MW increments

3-Year Scope *(DER Dispatch Enterprise Tool)*

	Duke Energy Carolinas			Duke Energy Progress		
DER Dispatch Tool	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Costs	$616,000	$770,000	$1.540,000	$184,000	$230,000	$460,000



Oliver Exhibit 9

XVII. Electric Transportation

The Electric Transportation program will establish a foundational level of fast charging infrastructure and determine best practices for cost-effective integration of various electric vehicle types. It will also serve to financially support the deployment of electric school and transit buses in conjunction with the 2016 Volkswagen settlement agreement.

The program will also allow system planners to assess the impacts of charging different types of electric vehicles, as well as impacts that various charging configurations have on the electric system.

In addition to evaluating grid impacts, the Electric Transportation pilot program will assess how all utility customers can benefit from increasing adoption of electric transportation. The pilot program will consist of five components:

1) Residential EV Charging Rebate,
2) Electric Vehicle School Bus Program,
3) Electric Vehicle Transit Bus Program,
4) DC Fast Charging Infrastructure Program, and
5) Education and Outreach.

Another benefit to advancing electric transportation is improved air quality by displacing hydrocarbon based fuels and lowering emissions.

Electric vehicles are coming to South Carolina as sales growth through the end of 2017 continued with a compound annual growth rate of 43% since 2011. Lack of charging stations is commonly cited as a barrier to purchasing an EV. The program estimates that approximately 1,000 public direct-current fast charging ("DCFC") plugs will be necessary by 2025 to support current forecasts of EV market growth. Currently, there are only 40 open-standard, publicly available DCFC plugs in South Carolina.

Duke Energy's SC Electric Vehicle pilot program has been filed in a separate proceeding, submitted to the South Carolina Public Service Commission on October 10. 2018. Additional details of the Electric Vehicle Program can be found in the following dockets:

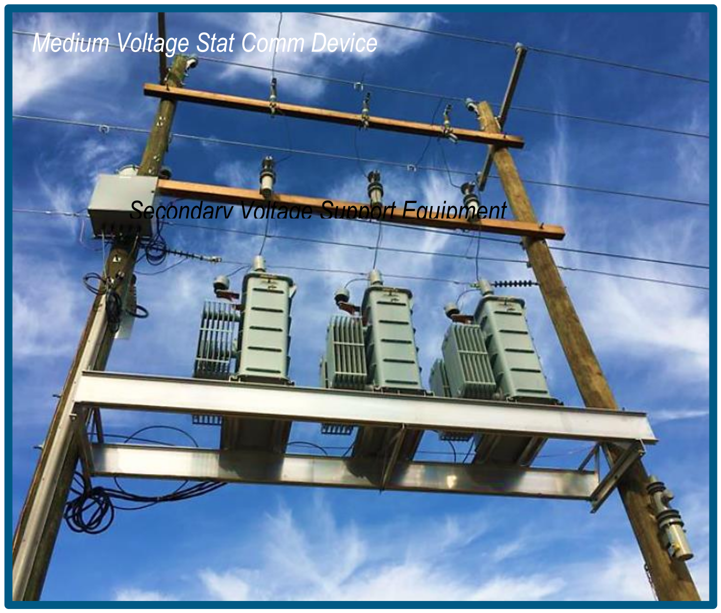
- DEC Docket No. 2018-321-E
- DEP Docket No. 2018-322-E

Oliver Exhibit 9

XVIII. Power Electronics for Volt/VAR

As the adoption of distributed energy resources (DER) (e.g., customer-owned solar and energy storage) reaches critical levels and microgrid technology matures, protective device technology must also advance to appropriately detect and respond to rapid voltage and power fluctuations that often accompany non-dispatchable resources such as solar.

As clouds move across the daytime sky and momentarily block sunlight from reaching solar panels, solar generation immediately ceases. As sunlight peaks through openings in the cloud cover, the solar panels begin generating, creating power spikes and voltage instability on the circuit. These intermittent power impacts occur and then change at rapid rates (in some cases sub-second) and frequently faster than the legacy electro-mechanical voltage management equipment like regulators and capacitors can handle.



Integrating advanced solid-state technologies like power electronics (i.e., static VAR compensators and other solid-state voltage support equipment), better equips the distribution system to manage power quality issues associated with increasing DER penetration.

The Power Electronics for Volt/VAR program is a limited-scale deployment focused on to validation of capabilities and benefits.

3-Year Scope *(Power Electronics)*

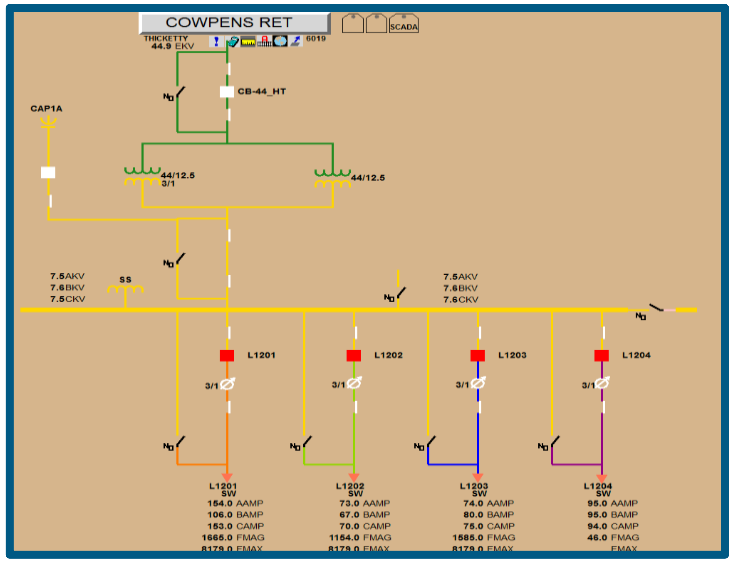
	Duke Energy Carolinas			Duke Energy Progress		
Power Electronics	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Costs	--	$271,000	$1,084,000	$76,000	$81,000	$324,000
VAR Sup Devices	--	1	3	--	--	1
Volt Sup Devices	--	--	--	--	16	12

Locations *(Power Electronics for Volt/VAR)*

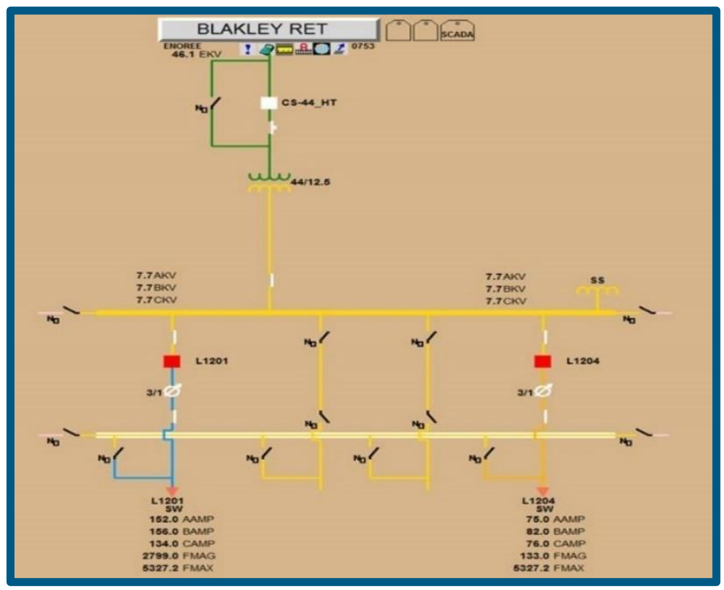
Year	Location	Jur
2020 - 2021	Blakely	DEC
2020 - 2021	Mount Hope	DEP
2021	Cowpens	DEC
2021	Bond Park	DEC
2021	Pamplico	DEP

Oliver Exhibit 9

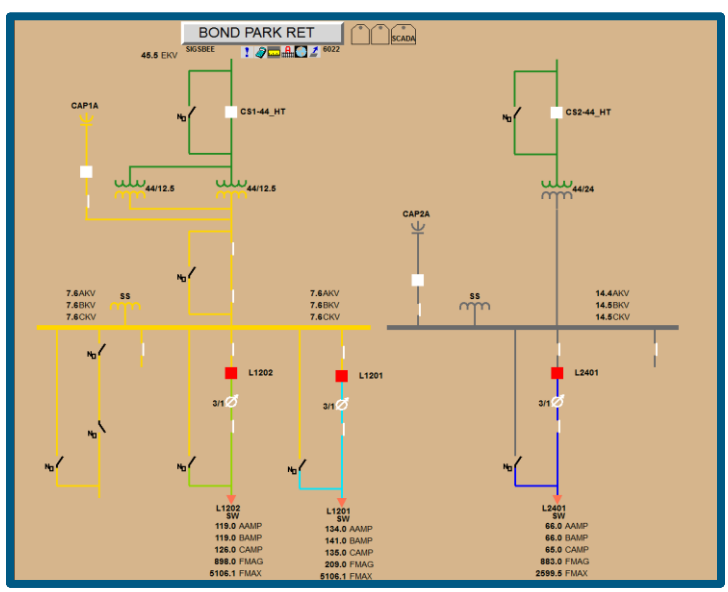
DEC: Cowpens 44kV Circuit One Line Diagram

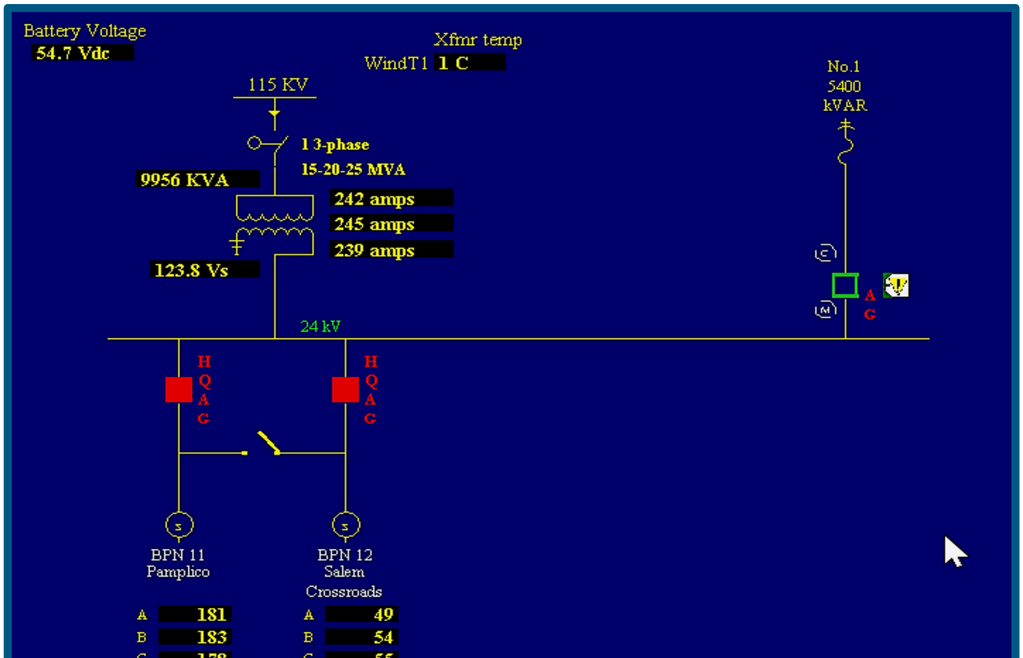


DEC: Blakely Retail Substation One Line Diagram

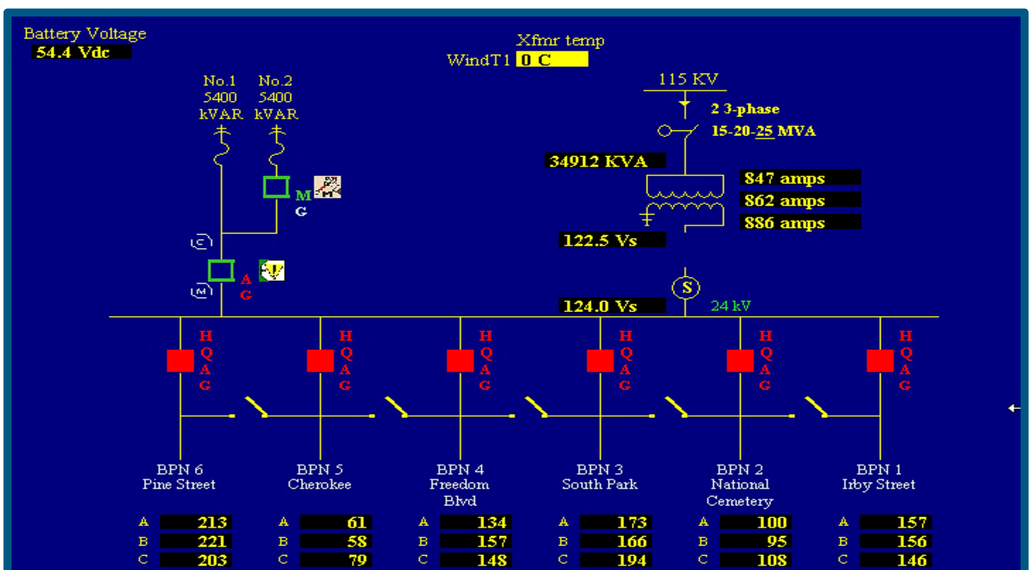


DEC: Bond Park Retail Substation One Line Diagram





DEP: Pamplico 115kV to 23KV Substation One Line Diagram



DEP: Florence Mt. Hope 115kV Substation One Line Diagram

XIX. Physical and Cyber Security

The program focuses on hardening above the standard compliance requirements. Transmission elements of the program include:

- **Transmission Substation Physical Security**
- **Windows-based Change Outs** to address cyber security standards for older Windows-based relays.
- **Cyber Security Enhancements for Non-Bulk Electric System Facilities**
- **Electromagnetic Pulse and Intentional Electromagnetic Interference (EMP/IEMI) Protection**

At the distribution system level, much of the focus involves securing and improving risk mitigation of remotely controlled field equipment. An example is enabling door alarms and entry notifications. Programs include:

- **Device Entry Alert System** (DEAS)
- **Distribution Line Device Cyber Protection**
- **Secure Access Device Management** (SADM) - a single tool to remotely and securely perform device management activities and event record retrieval on the entire transmission and distribution device inventory.

3-Year Scope *(Physical and Cyber Security)*

	Duke Energy Carolinas			*Duke Energy Progress*		
Phys & Cyber Security	**2019 ***	**2020 ***	**2021***	**2019***	**2020***	**2021***
TOTAL	**$18,310,551**	**$8,071,836**	**$11,531,470**	**$4,015,044**	**$8,912,032**	**$4,131,478**
Substation Physical Security*	$14,240,000	$3,277,500	$6,535,750	$2,760,000	$7,472,500	$2,639,250
Windows Based Unit Change outs*	$1,155,000	$1,155,000	$1,155,000	$345,000	$345,000	$345,000
Cyber-Security Enhancements for Non-BES Facilities*	--	$770,000	$1,155,000	--	$230,000	$345,000
EMP/IEMI Protection*	--	$385,000	$385,000	--	$115,000	$115,000
Device Entry Alert System	$151,560	$35,538	--	$54,573	$12,478	--
Secure Access Device Mgmt	$630,966	$109,083	--	$218,334	$38,178	--
Line Device Protection	$2,133,025	$2,339,715	$2,300,720	$637,137	$698,876	$687,228
Approx. No. of Units	54	57	43	160	160	101

* Actual costs will be captured on a per-site basis. This approach allows the Company to bundle multiple programs at the same site for better cost efficiency. *Projected SC portion of project costs.*

Entry alarm being installed in legacy controls

Device with integrated entry alarm capabilities

Oliver Exhibit 9

Transmission Substation Physical Security – High Security Perimeter Fencing

Oliver Exhibit 9

APPENDIX A: TRANSMISSION PROJECT SCOPES

2019 – 2021 DEC Transmission Projects

BLUE = *Project located in South Carolina*

Capital $ in Thousands

					Transmission System Intelligence				Transmission Hardening & Resiliency				Phys & Cy Security			
Project ID	**SC DEC Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
NP09283	Beckerdite Tie	$250	$8,750												X	
NP08987	Catawba Sw St 230kV	$65													X	
TBD	Cowans Ford 230kV	$300	$2,000												X	
TBD	Eno Tie	$9,000													X	
TBD	Eno Tap Bent 230kV	$2,520													X	
NP09278	Ernest SS 230kV	$300		$3,700											X	
NP09233	Harrisburg Tie230kV	$3,674													X	
NP09276	Jocassee Sw St 500KV	$4,080	$1,584												X	
NP09276	Jocassee Sw St 230kV	$1,920	$960												X	
NP09277	Lee Steam St 100kV		$2,450												X	
NP09251	Marshall Steam St 230kV	$1,761													X	
NP09235	Newport Tie 230kV	$1,602													X	
NP09279	North Greensboro Tie 230kV		$5,958												X	
NP09280	Parkwood Tie 230kV	$300	$4,284	$6,126											X	
NP09281	Pleasant Garden Tie 500kV		$8,160												X	
TBD	Riverbend		$5,000												X	
NP09236	Woodlawn Tie 230kV	$1,206													X	
NP09237	Wylie 100kV	$1,232													X	
TBD	Oconee Nuclear 230kV														X	
TBD	Oconee Nuclear 500kV														X	
TBD	Rural Hall Tie and SVC	$3,545													X	
TBD	Antioch Tie 500kV			$3,123											X	
TBD	East Durham Tie 230kV			$3,160											X	
TBD	Lakewood Tie 230kV			$2,500											X	
TBD	Morning Star Tie 230kV			$2,828											X	
W180435	Rural Hall Security Enhancements	$3,928													X	

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BLUE = *Project located in South Carolina*

					Transmission System Intelligence				Transmission Hardening & Resiliency				Phys & Cy Security			
Project ID	**SC DEC Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
BP18TRS1X	Transformer Repl Strategy 15 Units					X							X			
CP18ANFS	South Region Animal Fence Installation			$200											X	
CP18TTMC	Trans Temp Monitor Retrofits	$8			X											
DP18DBKN	Distribution Breaker Replacements	$203	$3	$3		X								X		
DP18DBKS	Distribution Breaker Replacements			$168		X								X		
FF20017T	FP 20017 Transmission FF	$2,231														X
FF20093T	SDM Blanket - FF20093T															X
HB20017T	FP 20017 Transmission HB- SDM D	$3,888														X
HB20093T	SDM Blanket - HB20093T- SDM D															X
NP04662	ONS Gang Sw Repl. (525KV Yell Bus)	$39						X								
NP04930	CNS & Newport - Allison Creek BW TU	$90	$403	$186		X										
NP08114	MNS (5) 525kV Gang Sw Repl			$196				X								
NP08199	MNS - Cowans Ford BW TU	$286	$72			X										
NP08420	McGuire Sw Sta-Woodchuck TU MEDIUM	$157				X										
NP08602	Marion Mn	$903				X	X						X	X		
NP08611	Marshville dist - Station Rebuild	$3					**X**						**X**	**X**		
NP08660	MNS (1)525kV &(2)230kV Gang Sw Repl	$1	$112					X								
NP08787	Leaksville Ret CS Replacement	$222			X		X	X	X							
NP08841	Auriga Polymers Inc.	$1,094			X	X	X							X		
NP08855	Reidsville Ret Repl 100kV Brk	$4	$1,491		X	X								X		
NP08858	Arrowood Ret	$476				**X**	**X**							**X**		
NP08867	Corning Cable System T&D-Rep Cap 1B	$221			X	X							X	X		
NP09016	Central Tie-TX Redun Bnk Diff	$146	$125	$1,138		X								X		
NP09017	Newport Tie TX Redun Bank Diffs	$137				X										
NP09074	Albemarle Sw Sta 100KV Brk Repl	$59	$750			X								X		
NP09076	Bridgewater Hydro(5) 100KV BRK Rep	$455				X								X		
NP09077	Clinton Tie(4)44KV&(3)100KV BRK Rep	$496				X								X		
NP09078	Longview Tie (8) 230KV BRK Repl	$3		$1,682		X								X		
NP09080	Oakboro Tie (2) 230KV BRK Repl	$55				X								X		
NP09083	Great Falls Sw Sta(7)100KV BRK Repl		$645	$3,519		X								X		
NP09088	SCHILTZ-WESTERN TAP STATION UPG	$7	$1,827		X	X	X							X		
NP09094	Winecoff Tie 44kv Grnd Bank Trf Rep	$6	$814	$1					**X**				**X**			

BLUE = *Project located in South Carolina*

Project ID	SC DEC Project Name	2019	2020	2021	Transmission System Intelligence				Transmission Hardening & Resiliency					Phys & Cy Security		
					Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
NP09167	Oxford Hydro SPCC Brk (5)	$207												X		
NP09170	Rhodhiss Hydro SPCC Brk (3)	$257												X		
NP09172	Glen Raven Series BJB	$624	$2		X	X	X	X						X		
NP09174	Mitchell River Series BJB	$3,841	$18		X	X	X	X						X		
NP09177	Durham Main SPCC		$716	$11											X	
NP09183	Rural Hall Tie SVC	$23,229	$2,550		X	X	X	X					X	X	X	
NP09196	Woodlawn Tie Add Redund	$1,378	$1			X								X		
NP09203	Parkwood Tie Add Redund	$11	$609		X	X	X									
NP09204	Harrisburg Tie Series BJB	$5	$1,306	$2		X								X		
NP09213	Pleasant GardenTie-GroundBkAdd	$1,631	$3				X		X				X			
NP09214	Sadler Tie-GroundBkAdd	$12	$1,054	$8			X		X				X			
NP09228	McGuire SFA 550kV and 242kV BRK Rep	$742	$1,614	$		X								X		
NP09229	Pleasant Garden PCB5 550kV BRK Rep	$201	$8,194	$4,826		X								X		
NP09230	Pleasant Garden PCB10 550kV BRK Rep					X								X		
NP09243	Denny Road Ret Structural Rbld	$8	$1,295	$10	X	X	X	X						X		
W170007	Unifi Yadkin T&D STA 2		$1,055	$16	X	X	X							X		
W170013	SEL1102 SEL3354 SDM Repl															X
W170016	Durham MN- Replace Transformer				X	X	X						X	X		
W170042	Una Ret Low Clearance Breaker Repl			$161										X		
W170053	Shady Grove Tie redund 100 kV bus d		$235	$2,010		X								X		
W170054	Sunset Retail Bank3 TX Replacement		$178	$2,463									X			
W170065	W Spartanburg Tie Rlbty Upg - W1700					X	X							X		
W170070	Putman Retail - Circuit Switcher Ad		$722	$16		X								X		
W170079	Gaston Shoals Hydro OCB Relpmt - W1			$304		X								X		
W170080	Ninety Nine Island Hydro OCB Replmt					X								X		
W170084	Blacksburg Tie Rlbty Upg - W170084					X	X							X		
W170085	Turner Shoals SW Sta Rlbty Upg		$303	$3		X							X	X		
W170090	Pacolet Tie Rlbty Upg		$301	$41		X	X							X		
W170091	E Greenville SS Rlbty Upg - W170091					X								X		
W170092	Glen Raven MN Rlbty Upg	$155	$2,980	$2		X								X		
W170093	Greenlawn SS Rlbty Upg - W170093		$351	$1,892		X								X		
W170094	Mcdowell Tie Rlbty Upg		$4,292	$46		X							X	X		

Oliver Exhibit 9

BLUE = *Project located in South Carolina*

Project ID	SC DEC Project Name	2019	2020	2021	Transmission System Intelligence				Transmission Hardening & Resiliency					Phys & Cy Security		
					Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
W170095	Shelby Tie Rlbty Upg	$132	$26	$2,393		X								X		
W170102	Wamsutta Rpl Rel_OCB		$573	$6		X								X		
W170113	Concord City Del 1 Rlbty Upg		$85	$1,076		X							X	X		
W170114	Cypress Tie Rlbty Upg		$312	$647		X	X						X	X		
W170115	Hendersonville Tie Rlbty Upg		$201	$1,737		X								X		
W170116	Newton Tie Rlbty Upg		$155	$1,161		X							X	X		
W170139	Broad River E C Del 2 Rlbty Upg	$300	$3			X								X		
W170141	Grassy Pond Ret Rlbty Upg		$527	$9		X								X		
W170142	Hamrick Mills Musgrov Pl Rlbty Upg		$309	$3		X								X		
W170145	Parkdale America LLC Pl 7 Rlbty Upg		$795	$9		X								X		
W170146	Glenwood Ret Rlbty Upg	$2,285	$10			X							X	X		
W170147	Rich Mountain Ret Reliability Upg		$442	$6		X								X		
W170148	Nebo Ret Rlbty Upg		$506	$8		X							X	X		
W170149	North Lakes Ret Rlbty Upg		$809	$12		X							X			
W170152	Oakboro Ret Rlbty Upg		$684	$8		X								X		
W170154	N Kannapolis Ret Rlbty Upg		$312			X								X		
W170155	Harrisburg Tie Rlbty Upg		$4,513	$16		X								X		
W170156	Hawthorne Rd Ret Rlbty Upg		$985	$13		X							X	X		
W170157	Campobello Tie Rlbty Upg		$302	$41		X								X		
W170158	Cliffside SS 1-4 Syd Rlbty Upg		$334	$1,292		X								X		
W170159	Cliffside SS 5 Syd Rlbty Upg		$133	$26		X								X		
W170161	Jocassee Sw Sta Rlbty Upg		$107	$1,054		X								X		
W170162	ENO 230kV Tap Bent Rlbty Upg					X								X		
W170163	Greenwood Tie Rlbty Upg			$672		X								X		
W170164	Pinewood Ret Rlbty Upg		$609	$9		X								X		
W170166	Ogden Ret Rlbty Upg		$	$311		X								X		
W170167	Pink Harrill Tie Rlbty Upg		$679	$13		X							X	X		
W170169	Summerfield Ret Rlbty Upg		$684	$8		X								X		
W170171	Burlington MN Rlbty Upg	$1,236	$16			X								X		
W170176	Horseshoe Tie Rlbty Upg		$211	$1,352		X								X		
W170180	Pisgah Tie Rlbty Upg		$2,807	$6		X								X		
W170183	Martin-Marietta Bessemer City		$278	$2		X										

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					Transmission System Intelligence				Transmission Hardening & Resiliency				Phys & Cy Security			
Project ID	**SC DEC Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
W170185	Tremont Rlbty Upg		$440	$10		X										
W170186	Rpl RTUs DEC North Region				X		X									
W170187	Rpl RTUs DEC South Region		$291	$2	X		X									
W170188	Rpl RTUs DEC Central Region	-$172	-$4	$323	X		X									
W170197	Mooresville Rlbty Upg		$304	$1,718		X							X	X		
W170199	Anderson Tie Rlbty Upg		$2,807	$6	X	X	X						X	X		
W170200	Blue Ridge E C Del 14 Rlbty Upg	$152	$692	$2		X								X		
W170201	Bannertown Tie Install Vanquish Fen		$351	$1											X	
W170202	Schlitz-Western Tap Install Vanquis														X	
W170204	Ridgeview Retail Install Vanquish F														X	
W170205	Dan Valley Ret Install Vanquish Fen		$350	$2											X	
W170206	Sealed Air Seneca Pl Rlbty Upg		$887	$5		X								X		
W170207	Coleman Ret Rlbty Upg		$103	$340		X								X		
W170208	Eastgate Ret Rlbty Upg	$247	$71	$2,055		X								X		
W170209	Mt Tabor Ret Rlbty Upg		$809	$12		X								X		
W170210	Oak Ridge Ret Rlbty Upg		$440	$10		X								X		
W170211	GE Aircraft Eng Rlbty Upg		$332	$4		X								X		
W170212	Laurens EC Del 28 Rlbty Upg			$294		X								X		
W170213	Roddey Rel Upg Catawba Pacolet		$271	$1,555		X										
W170214	Mebane Tie RlbtyUpg		$155	$1,327	X	X	X									
W170215	Fairntosh Ret RlbtyUpg		$	$157		X								X		
W170216	Pickens Tie Rlbty Upg	$397	$911	$5,422	X	X	X						X	X		
W170217	Michelin Prime Dnldsn Rlbty Upg		$437	$11		X										
W170219	Morganton Tie Rlbty Upg			$139	X	X	X							X		
W170221	Roughedge Tie Rlbty Upg	$14	$1,762	$235		X							X	X		
W170222	E Spencer Dist Rlbty Upg - W170222		$439	$9		X								X		
W170223	Beech St Ret Rlbty Upg			$155		X								X		
W170225	IBM Corp Raleigh Rd Rlbty Upg	$687	$5			X								X		
W170226	JocasseeSwSta ComplianceDFR Upg			$163	X											
W170228	Oconnee 525kV SwYd SER Rpl	$14	$60		X		X									
W170230	Oconnee 230kV SwYd SER Rpl	$13	$24	$37	X		X									
W180009	South Region 2018 Transgard Fence P														X	

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Project ID	SC DEC Project Name	2019	2020	2021	Transmission System Intelligence: Sys Intel & Monitoring	Transmission System Intelligence: Digital Relay	Transmission System Intelligence: Remote Sta. Monitor	Transmission System Intelligence: Remote Cntl Switches	Transmission Hardening & Resiliency: 44kV System Upgrades	Transmission Hardening & Resiliency: Network Radial Subs	Transmission Hardening & Resiliency: Sub. Flood Mitigation	Transmission Hardening & Resiliency: Target Line Rebuilds	Transmission Hardening & Resiliency: TX Bank Replace	Transmission Hardening & Resiliency: T/D Oil-Gas Breakers	Phys & Cy Security: Physical Security	Phys & Cy Security: Windows Based Units
W180042	Waddell Rd Ret Banks 1 and 2 TX Rpl	$1				X							X	X		
W180061	Armacell LLC Mebane Pl-Replace CS-E	$4			X		X	X	X							
W180062	Kimesville Ret-Replace CS and two 1	$12			X		X	X	X					X		
W180084	Ripp Sw Sta		$204	$1,318		X								X		
W180093	Sadler Tie - redundant 100kv bus di		$804	$16	X	X	X							X		
W180220	BASF Corp Transformer Bank Replacement												X			
W180222	N Greenville Tie Transformer Bank Replacement				X	X	X						X			
W180224	Daniels Retail Transformer Bank Replacement				X	X	X						X			
W180225	Parkway SS Transformer Bank Replacement					X							X			
W180226	Monroe Rd Retail Transformer Bank Replacements					X							X			
W180227	Concord Main Transformer Bank Replacements					X							X			
W180228	Clark Hill Tie Transformer Bank Replacements					X							X			
W180229	Lancaster Retail Transformer Bank Replacements					X							X			
W180230	Parkdale Amer P1 21 T&D Transformer Bank Replacements			$304		X							X			
W180231	Arrowood Retail Transformer Bank Replacements					X							X			
W180232	Hawthorne Rd Retail Transformer Bank Replacements				X	X	X						X	X		
W180233	Fairplains Retail Transformer Bank Replacement				X	X	X						X			
W180234	Buxton St Retail Transformer Bank Replacement				X	X	X						X			
W180235	Vandalia Retail Transformer Bank Replacement				X	X	X						X			
W180236	Durham Main Transformer Bank Replacement				X	X	X						X			
W180237	Whitehall Retial Transformer Bank Replacement					X							X			
W180239	Augusta Rd Retail Transformer Bank Replacements				X	X	X						X			
W180240	Knollwood Retail Transformer Bank Replacements				X	X	X						X			
W180241	Una Retail Transformer Bank Replacement				X	X	X						X			
W180242	Glenwood Retail Transformer Bank Replacements					X							X			
W180245	Shattalon Sw Sta (STA1376) - Instal			$352											X	
W180248	Durham Mn (STA 1292) - Install Vanq		$351	$1											X	
W180250	Mt Tabor Ret (STA 1140) - Install V														X	
W180251	Reidsville Ret (STA 1225) - Install														X	
W180252	Hinshaw Ret (STA 1522) - Install Va														X	
W180253	Ashe St Sw Sta (STA 1174) Install		$351	$1											X	
W180254	Swaimtown Ret (STA 1538) - Install														X	

Oliver Exhibit 9

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					Transmission System Intelligence				Transmission Hardening & Resiliency						Phys & Cy Security	
Project ID	**SC DEC Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
W180255	Lewisville Ret (STA 1465) - Instal														X	
W180256	Sedge Garden Ret (STA 1674) - Inst														X	
W180257	Rudd Ret (STA 1803) - Install Vanq														X	
W180258	E Thomasville Ret (STA 1369) - Inst														X	
W180259	Pelham Retail 100kV HT Breaker Replacement					X								X		
W180260	Groomtown Ret (STA 1568) - Install														X	
W180261	King Ret (STA 1560) - Install Vanq			$352											X	
W180262	Lake Townsend Ret (STA 4078) - Inst														X	
W180263	Greer City Sta 2 100kV HT Breaker Replacement					X								X		
W180264	St Marks Ret (STA 5181) - Install V		$351	$1											X	
W180265	Oconee 525kV Swyd OCB 40 Breaker Re					X								X		
W180266	Oconee 230kV Swyd OCB 101 Breaker R					X								X		
W180267	2020 Belton Tie (STA 1106) - Instal		$351	$1											X	
W180268	Oakvale Tie (STA 1221) - Install Va			$352											X	
W180269	Central Tie (STA 1285) - Install Va		$351	$1											X	
W180270	2023 Berea Rd Ret (STA 1484) - Inst														X	
W180271	Lawsons Fork Tie (STA 1212) - Insta		$351	$1											X	
W180272	2023 Brushy Creek Ret (STA 1442) -														X	
W180273	2023 Hurricane Creek Ret (STA 1752)														X	
W180274	2020 Augusta Rd Ret (STA 1218) - In		$351	$1											X	
W180282	2020 Central Region Vanquish Fence														X	
W180285	2021 Central Region Vanquish Fence														X	
W180308	Distribution Breaker Replacements (North) - Vandalia Retail					X								X		
W180309	Distribution Breaker Replacements (North) - Millers Creek Retail					X								X		
W180311	Distribution Breaker Replacements (North) - Gilbreath Retail					X								X		
W180312	Distribution Breaker Replacements (North) - Randolph Ave Retail					X								X		
W180313	Distribution Breaker Replacements (North) - Ragsdale Retail					X								X		
W180314	Distribution Breaker Replacements (North) - Durham Main					X								X		
W180317	Distribution Breaker Replacements (North) - Fairfax Rd Retail					X								X		
W180320	Distribution Breaker Replacements (North) - Merritt Dr Retail					X								X		

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					Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
W180322	Distribution Breaker Replacements (North) - Research Triangle Retail					X								X		
W180329	Distribution Breaker Replacements (Central) - Bellhaven Retail					X								X		
W180332	Distribution Breaker Replacements (Central) - Bethlehem SS					X								X		
W180334	Distribution Breaker Replacements (Central) - Buckeye Dist					X								X		
W180335	Distribution Breaker Replacements (Central) - Canoe Creek Retail					X								X		
W180336	Distribution Breaker Replacements (Central) - Chambers Retail					X								X		
W180337	Distribution Breaker Replacements (Central) - Claremont Retail					X								X		
W180338	Distribution Breaker Replacements (Central) - Denton Retail					X								X		
W180339	Distribution Breaker Replacements (Central) - Gastonia Main					X								X		
W180340	Distribution Breaker Replacements (South) - Bainbridge Retail					X								X		
W180341	Distribution Breaker Replacements (South) - Blakley Retail					X								X		
W180342	Distribution Breaker Replacements (South) - Byrum Creek Retail					X								X		
W180343	Distribution Breaker Replacements (South) - IVA SS					X								X		
W180344	Distribution Breaker Replacements (South) - Kanuga Retail					X								X		
W180345	Distribution Breaker Replacements (South) - Roper Mtn Retail					X								X		
W180349	Distribution Breaker Replacements (South) - Tigerville Retail					X								X		
W180368	Beckerdite Tie Reliability Upgrade			$7,189	X	X	X							X		
W180377	Belton Tie Reliability Upgrade			$3,543		X								X		
W180383	Hodges Tie Reliability Upgrade			$6,278	X	X								X		
W180385	Central Tie Reliability Upgrade			$3,087		X	X							X		
W180393	Crest St Retail Reliability Upgrade			$3,087	X	X	X						X	X		
W180400	Oconee 230kV Swyd New Relay Control					X										
W180416	Distribution Breaker Replacements (West) - Marion Main					X								X		
DP18DFRS	DFR Replacements	$4			X											
DP18RTUC	RTU Replacements	$1	$301				X									
DP18RTUN	RTU Replacements	$14	$119				X									
DP18RTUS	RTU Replacements	$92					X									
DP18SERN	SER Replacements	$9					X									
DP18SERS	SER Replacements	$13					X									

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Project ID	**SC DEC Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
NP03831	ONS Ph III Line P&C Upgrade (Carrie	$20	$147			X										
NP04397	ONS 525kV 50B/62B Relay	$909	$2			X										
NP04411	Oconee 525kV Bus Diff	$1				X										
NP04831	E Greenville Sw Sta P&C Upgrade	$3				X								X		
NP08042	OPGW Marshall to McGuire	$124			X											
NP08043	OPGW Woodlawn to Kenilworth				X											
NP08310	N Greenville Tie DFR Repl				X											
NP08325	Abbotts Creek Tie P&C Upgrade	$8	-$889			X								X		
NP08327	Anderson Tie Cap Neutral Relay Repl					X										
NP08336	Belews Creek_Rural Hall B&W TU					X										
NP08367	Glenway SS Ckt Relay Rep	$6	$2	$2		X										
NP08421	Cliffside 5 - 230 kV TU	$3	$187	$1,064		X										
NP08424	Tuckasegee Tie - Thorpe 161kV TU	$176				X										
NP08425	Toxaway Tie - Fiber B&W TU	$193				X										
NP08789	Lancaster Mn-Cap Neut Relay Repl	$168				X										
NP08801	Hilltop Tie - 44kV Line TU's					X								X		
NP08802	Gaston Shoals - Line Relay TU's			$55		X							X			
NP08803	Clark Hill Tie - Line Relay TUs	$3	$886	$1		X								X		
NP08804	E Hickory Ret Ckt Relay Rpl					X										
NP08832	Randleman Rd Ret Relay Upgrade	$917			X	X	X							X		
NP08836	Holly Hill Ret Tap - Relay Upgrade				X	X	X									
NP08844	Kings Mtn Main - Install SCADA	$17					X									
NP08849	E Spartanburg Tie - Relay Upgrade	$58				X	X									
NP08876	Woodruff Tie - Line Relay TU's	$916	$2			X								X		
NP08915	Burlington MN Bk 5 Rly Upgrade					X	X									
NP08916	Thomasville Mn P&C Upgrade	$4	$425			X										
NP09024	Jocassee Hydro Unit 4 Relay Upgrade					X										
NP09036	Belews Creek Unit 2 Relay Upgrade					X										
NP09037	Jocassee Hydro Unit 1 Relay Upgrade					X										
NP09038	Jocassee Hydro Unit 2 Relay Upgrade					X										
NP09039	Marshall Steam Unit 1 Relay Upgrade	$20	$4			X										
NP09046	Forest Hill Ret Ckt Rely Repl	$289				X								X		

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Project ID	**SC DEC Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
NP09047	Hendersonville Mn Ckt Rely Repl	$395				X								X		
NP09048	Norris Ret Ckt Rely Repl	$269				X							X	X		
NP09050	Katherine Tap Swapover Repl	$29				X										
NP09051	Clover Tie 44kV TUs	$2	$538	$1		X										
NP09052	Peacock Tie 44kV TUs	$440				X										
NP09054	Reedy River Tie P+C Repl	$9	$79	$2,386		X							X	X		
NP09055	Madison Tie P+C Upgrade	$7	$1,161			X								X		
NP09056	Garrett Rd Ret Swapover Repl	$132				X										
NP09057	Kernersville Ret - Swapover Repl - NP09057	-$319	$296			X										
NP09059	Crawford Rd Tap Swapover Repl	$4	$765			X										
NP09062	ASHEVILLE HWY RETAIL BANK RLY UPG		$1	$1,179		X										
NP09081	Branch Rd Ret Ckt Rely Repl	$276				X								X		
NP09216	Sugar Hill Tie 44kV Radial TUs		$11	$1,088		X										
NP09223	Hickory Tie-44kV TUs	$613	$4,703	$957		X								X		
NP09224	Emergent Antioch Tie JF Relay Repl				X	X	X									
NP3807	OCONEE 525/230 KV SWYD IMUX					X										
W170010	Unifi Madison T&D RLY UPG				X											
W170020	Monroe Mn P&C Upgrade		$230	$3,440		X								X		
W170082	Bowen Tap SCADA Upgrade - W170082	$1					X									
W180459	DEC Transmission Condition Based Monitoring (CBM)				X											
NP08546	Spurrier 44 kV Line	$1	$1	$4,650					X			X				
NP08548	Capps - Hendersonville Line Rbld	$40	$250	$4	X				X	X		X				
NP08549	Quebec 44 kV Line	$40	$259	$2,917	X				X			X				
NP08550	Rockford 44 kV Line	$5			X				X			X				
NP08607	Pacolet Tie - Robat Line Rly TU	$249				X	X									
NP09008	Duke Univ 44 kV Underground System	$1,107			X				X					X		
NP09099	Cabin Creek - Stevens Tap Rebld	$5	$4	$7	X				X			X				
NP09100	Hankins Line Rbld Str 104		$152	$8	X				X			X				
NP09101	Hendersonville Main Tie 44 kV Rbld	$5,466	$2		X				X	X		X				
NP09102	Rockford 44 kV Line Rbld - Level Cr	$13	$1,201	$3,142	X				X			X				
NP09103	Spindale 44 kV Line Rebuild	$2,173	$1,495	$12	X				X			X				

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NP09106	Rusty OHGW Replacement Stemmons 230	$10	$10	$10	X											
NP09175	Wilkes Tie 230 Expansion		$606	$10,850	X	X	X	X						X		
NP09176	Peach Valley Tie 230kV Series BJB	$2,797	$32			X	X	X						X		
NP09198	Pisgah Tie Series BJB	$9	$2,131	$4,386	X	X										
NP09199	Winecoff Tie Series BJB	$851												X		
NP09201	Rural Hall Tie Series BJB	$12	$925	$2	X	X	X							X		
NP09202	Hodges Tie Add Redund	$1,952	$1,923	$19	X	X	X	X						X		
W170015	Stamey Tie Add Redund		$1,861	$1,369		X								X		
W170019	Shiloh Sw Sta Add Redund		$720	$1,057		X										
W170037	Wylie Series 100 kV BJB and Zoar Li	$370	$3,118	$2,180	X	X	X	X						X		
W170047	Lawson Fork to Pacolet Retail		$21	$328					X			X				
W170075	LaurensECDel 25 Mldn Rlbty Upg		$1,911	$15		X	X							X		
W170120	Webster Tie Reliability Upgrade	$173	$2,530	$1		X	X						X	X		
W170123	Cooper Industrial Cap Pl Tap Rebuil		$35	$621					X			X				
W170124	Cabin Creek 44kV Line Rutledge Rbld		$137	$608	X				X			X				
W170125	McCalister 44kV Line WalkerT Rbld			$12	X				X			X				
W170126	Rocky Creek #1 44kV Line Rbld			$12					X			X				
W170127	Rockford Line Rebuild Chatham MFG		$77	$31	X				X			X				
W170128	Belfast 44 kV Line Rebuild	$97	$28	$337	X				X	X		X				
W170129	Spindale 44kV Rebuild FairviewT		$12	$6	X				X			X				
W170130	Camp Creek Cherokee Connector Line		$12	$148	X				X	X		X				
W170178	Shoals 44kV Line Rebuild Hodges		$34	$1,072					X			X				
W180223	Cleghorn Tap 44 kV Line Rebuild			$22					X			X				
W180244	JP Stevens 44 kV Tap Rebuild			$22					X			X				
W180280	Sigsbee A&B 44 kV Line Rebuild			$22	X				X			X				
W180287	Esto 100 kV Line Rebuild			$22								X				
W180288	Campobello A&B 44 kV Line Rebuild			$22	X				X			X				
W180289	Stonewall Tap 44 kV Line Rebuild			$22					X			X				
W180290	Neals Creek Tap 44 kV Line Rebuild			$22					X			X				
W180291	Jackson 44 kV Line Rebuild			$22	X				X			X				
W180292	Blue Ridge EC Del 16 44 kV Rebuild			$22					X			X				
W180293	Liberty 44 kV Line Rebuild			$22	X				X			X				

BLUE = *Project located in South Carolina*

					Transmission System Intelligence				Transmission Hardening & Resiliency				Phys & Cy Security			
Project ID	**SC DEC Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
W180294	Harmony 44 kV Line Rebuild			$22	X				X			X				
W180372	York EC Del 20 GOAB Replace			$27				X								
W180374	Sawmill #1&2 44 kV Line Rebuild			$22	X				X			X				
W180375	Dale 44 kV Line Rebuild			$22					X			X				
W180376	James 44 kV Line Rebuild			$22	X				X			X				
W180378	Wick #2 44 kV Line Rebuild			$22					X			X				
W180379	Lowe 44 kV Line Rebuild			$22	X				X			X				
W180380	Linwood 44 kV Line Rebuild			$22	X				X			X				
W180381	Loray 44 kV Line Rebuild			$22	X				X			X				
W180388	Mebane 44 kV - Switch Rebuild			$27					X			X				
W180384	Bessemer 44 kV Line Rebuild			$22	X				X			X				
	TOTAL - DEC - NC & SC	**$105,698**	**$134,428**	**$136,554**												

Oliver Exhibit 9

2019 – 2021 DEP Transmission Projects

BLUE = *Project located in South Carolina*

Capital $ in Thousands

					Transmission System Intelligence				Transmission Hardening & Resiliency						Phys & Cy Security	
Project ID	**SC DEP Project Name**	**2019**	**2020**	**2021**	**Sys Intel & Monitoring**	**Digital Relay**	**Remote Sta. Monitor**	**Remote Cntl Switches**	**44kV System Upgrades**	**Network Radial Subs**	**Sub. Flood Mitigation**	**Target Line Rebuilds**	**TX Bank Replace**	**T/D Oil-Gas Breakers**	**Physical Security**	**Windows Based Units**
E180070	Asheville S.E. Plant 230	$910	$800												X	
E180052	Blewett 115kV		$600												X	
TBD	Brunswick 230kV		$6,000												X	
F170407B	Canton 115kV	$908													X	
E180053	Jacksonville 230 & SVC	$500	$4,500												X	
E180054	Lee 230	$500	$6,500												X	
F170407D	Richmond 500kV	$4,632													X	
E180074	Robinson 230kV	$500	$4,750												X	
E180045	Roxboro 230kV		$6,500												X	
TBD	Shearon Harris 230kV		$6,000												X	
TBD	Sutton Plant 230kV	$800													X	
F170407C	Tillery 115kV	$379													X	
F170407A	Walters 115kV	$2,802													X	
E180072	Weatherspoon 115kV & 230kv	$600													X	
TBD	Cane River 230 & SVC		$1,000	$6,250											X	
TBD	Cumberland 500kV			$5,300											X	
TBD	Durham 500kV			$4,550											X	
TBD	Mayo 500kV			$3,600											X	
TBD	Person 500kV			$5,150											X	
TBD	Wake 500kV			$5,100											X	
F140606D	Micaville 115kV - Rebuild Substatio	$1			X	X							X	X		
F140606H	Wilmington Sunset Park 115kV - Rebu	$136			X	X							X	X		
F140609H	Elm City 115kV - Replace 115kV Capa	$291												X		
F140609M	Rocky Mt 230kV - Repl TOIL Brkrs, P	$12				X								X		
F140609N	TILLERY HEP-REPL CIR BREAKERS	$75				X								X		
F150130A	Jacksonville City 115kV - Repl 4 T	$159				X								X		
F160119C	MIlburnie 230kV - Replace 10 CB's	$1,393	$45			X							X	X		
F160212A	Swannanoa 115kV - Repl 4 xformers,	$172	$380		X	X							X	X		
F160527A	Robinson SEP - Replace #1 230-115kV	$		$228	X	X								X		

Oliver Exhibit 9

BLUE = *Project located in South Carolina*

Capital $ in Thousands

					Transmission System Intelligence				Transmission Hardening & Resiliency						Phys & Cy Security	
Project ID	SC DEP Project Name	2019	2020	2021	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
F160620A	Distribution Oil Breaker Replacemen	$3,000	$3,000											X		
F161110A	Pine Lake 230kV - Repl 6 Dist Oil B	$1,428	$227										X	X		
F170801B	Dillon 115kV - Rebuild Substation	$	$1,158	$4,599	X	X							X	X		
F170801U	Hartsville 115kV - Rebuild Substati	$	$2,338	$4,382	X	X							X	X		
F170915B	Beaverdam 115kV - Rebuild Substatio	$	$2,295	$3,798		X							X	X		
F140606L	Sumter Industrial 115kV - Replace T		$174										X	X		
F160212B	Canton 115kV - Repl 5 CBs, 4 CCVTs,		$1,803	$242		X								X		
E170012	Chestnut Hills Replace 2 115kV CBs,		$422			X	X						X	X		
F170911F	Cary Piney Plains 230kV - Repl CB,		$160	$803		X							X	X		
E180030	Black Creek Sw Sta Replace oil brea		$936	$7		X								X		
F150213A	West End 230kV - Replace 3-Phase Re		$2										X			
F160212C	Baldwin 115kV - Replace Transformer		$1,226	$186	X	X							X			
F170801A	Cheraw 115kV - Rebuild Substation		$1,546			X							X	X		
F170801C	Florence Ebenezer 230kV - Rebuild S		$1,546			X							X	X		
F170801D	Florence West 230kV - Rebuild Subst		$658			X							X	X		
F170801E	Hemingway 115kV - Rebuild Substatio		$670			X							X	X		
F170801F	Lumberton 115kV - Rebuild Substatio		$2,563			X					X		X	X		
F170801G	Marion 230kV - Rebuild Substation		$1,163			X								X		
F170801H	Marion Bypass 115kV - Rebuild Subst		$2,018			X							X	X		
F170801I	Mullins 115kV - Rebuild Substation		$1,546			X							X	X		
F170801J	Olanta 230kV - Rebuild Substation		$670			X							X	X		
F170801K	Chadbourn 115kV - Rebuild Substatio		$2,462			X							X	X		
F170801L	Rockingham 230kV - Rebuild Substati		$2,069			X							X	X		
F170801M	Fair Bluff 115kV - Rebuild Substati		$1,546			X							X	X		
F170801N	Rockingham West 115kV - Rebuild Sub		$1,163			X							X	X		
F170801O	Tabor City 115kV - Rebuild Substati		$677			X							X	X		
F170801P	Sumter North 230kV - Rebuild Substa		$2,462			X							X	X		
F170801Q	Wadesboro 230kV - Rebuild Substatio		$677			X							X	X		
F170801R	Weatherspoon 230kV - Rebuild Substa		$677			X							X	X		
F170801S	Bethune 115kV - Rebuild Substation		$2,563			X							X	X		
F170801T	Clarkton 115kV - Rebuild Substation		$2,069			X							X	X		
F170802A	Grantham 115kV - Rebuild Substation		$1,170			X							X	X		

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Capital $ in Thousands

Project ID	SC DEP Project Name	2019	2020	2021	Transmission System Intelligence: Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	Transmission Hardening & Resiliency: 44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Phys & Cy Security: Physical Security	Windows Based Units
F170905B	Spruce Pine 115kV - Rebuild Substat		$2,166			X							X	X		
F170905D	Emma 115kV - Rebuild Substation		$2,166			X							X	X		
F170905G	Liberty 115kV - Rebuild Substation		$2,166			X							X	X		
F170905H	Littleton 115kV - Rebuild Substatio		$2,166			X							X	X		
F170905J	Pittsboro 230kV - Rebuild Substatio		$2,166			X							X	X		
F170905K	Mt. Gilead 115kV - Rebuild Substati		$2,166			X							X	X		
F170906A	Raleigh Northside 115kV - Rebuild S		$2,166			X							X	X		
F170911A	Spring Hope 115kV - Rebuild Substat		$2,166			X							X	X		
F170911B	Warrenton 115kV - Rebuild Substatio		$2,166			X							X	X		
E170009	Mayo SEP Replace 3 Westinghouse 500			$530		X										
E180051	Dillon North Replace 3 Ph regulator			$563									X			
F170911C	Raleigh South 115kV - Rebuild Subst					X							X	X		
F170911D	Roxboro South 230kV - Rebuild Substation					X							X	X		
F170911E	Souther Pines 115kV - Rebuild Subst					X							X	X		
F170911G	Henderson East 230kV - Repl CBs, Re			$803		X							X	X		
F170911H	Neuse 115kV - Repl Circuit Sw, Regu			$803		X							X	X		
F170913A	Kingstree North 230kV - Rebuild Ban			$3,604		X							X	X		
F140606S	Siler City 115kV - Relocate & Const			$220		X							X	X		
E170011	Delco 230 Replace CB1279 Sutton Sou			$277		X								X		
E170019	Wake 500 Replace 3 - 500kV West LWE			$1,620		X								X		
F140620T	Sumter 230kV-Rpl Bkrs/Rly Prtctn/Pn	$1,078	$352			X							X	X		
F140620Z	Wilmington Elementis 115kV - Rebuil	$206				X	X									
F141120A	Kings Bluff 115kV - Install 7.5 MVA	$391				X							X			
F150212C	Florence Mars Bluff 115kV-Rebuild S	$1,241	$321			X							X	X		
F170112A	Method 230kV - Replace 6 Oil CBs	$265												X		
F170112B	Walters H.E. Plant - Repl 115kV CB	$												X		
F140620X	Roxboro S.E. Pl-Repl N & S 230kV Bu		$1			X										
F170920A	Milburnie 230kV - Replace Breakers,		$300	$448		X								X		
E170007	2019 Transformer Bank Replacements		$500	$1,910		X							X			
F170224C	Raleigh 115kV - Rebuild Substation		$262	$3,239		X							X	X		
F170224B	Vanderbilt 115kV - Repl 2 Transform		$2,488	$816		X							X	X		
F140620W	HENDERSON NORTH-REBUILD SUB		$1,137			X							X	X		

Oliver Exhibit 9

BLUE = *Project located in South Carolina*

Capital $ in Thousands

Project ID	SC DEP Project Name	2019	2020	2021	Transmission System Intelligence: Sys Intel & Monitoring	Transmission System Intelligence: Digital Relay	Transmission System Intelligence: Remote Sta. Monitor	Transmission System Intelligence: Remote Cntl Switches	Transmission Hardening & Resiliency: 44kV System Upgrades	Transmission Hardening & Resiliency: Network Radial Subs	Transmission Hardening & Resiliency: Sub. Flood Mitigation	Transmission Hardening & Resiliency: Target Line Rebuilds	Transmission Hardening & Resiliency: TX Bank Replace	Transmission Hardening & Resiliency: T/D Oil-Gas Breakers	Phys & Cy Security: Physical Security	Phys & Cy Security: Windows Based Units
F170223I	Dunn 230kV - Rebuild Substation		$610			X							X	X		
F170224A	Florence South 115kV - Rebuild Subs		$4,100			X							X	X		
F170224D	Benson 230kV - Rebuild Substation		$1,719			X							X	X		
F160613A	Castle Hayne 230kV Sub-Folkstone 11						X	X								
F170515	Flooded Sub program manual cash flow										X					
F150608A	Evergreen Packagng 115kV- Constr Ne					X	X						X	X		
F140805B	Camden-Camden Junction 115kV - Repl											X				
F140618L	Weatherspoone Plt-Delco 230kv-Repl						X	X								
F140805A	Sapona #2 CM 230kV - Rebuild Substa			$		X							X			
F170905F	Wilmington Invista 230kV - Complete			$1			X									
E180028	Zebulon 115kV - Rebuild Station con			$214										X		
E180063	CBM Pre-Deployment				X											
F170224H	Cane River 230kV - Add 2nd Bank				X	X							X			
F170224I	Cane River 230kV - Add 2nd 115kV Bu					X								X		
F170623B	System - Transformer Replacements					X							X			
F170915A	Black Mountain 115kV - Repl Cs, Reg					X							X	X		
F170515C	Whiteville 115kV - Flooded Substati	$200	$2,000	$1,000							X					
F170515D	Goldsboro Weil 115kV - Flooded Subs	$600	$2,000								X					
F170515E	Grifton 115kV - Flooded Substation	$200	$2,467	$5,658							X					
F170504A	Angier 230kV - SB17 Work		$958	$443										X		
F170515G	Asheboro 230kV - SB17 Work		$614	$387		X								X		
F170515B	Greenville 230kV - Flooded Substati		$1,200	$3,000							X					
F170515F	Lee S.E. Plant - Flooded Substation		$1,200	$1,000							X					
F170525A	Canton 115kV - SB17 Work		$500	$2,000		X								X		
F170626C	Fayetteville 230kV - Sb17 Work 1			$1,812		X								X		
F170517D	Asheboro East 115kV - SB17 Work			$483		X								X		
F170518A	Asheboro South 115kV - SB17 Work			$1,309		X							X	X		
F170626B	Erwin 230kV - SB17 Work			$571		X								X		
F170627B	Florence 230kV - SB17 Work			$444		X								X		
F170714B	Marion 230kV - SB17 Work			$4,195		X								X		
F170717A	Wommack 230kV - SB17 Work			$2		X								X		
F170717C	Lee 230kV - SB17 Work			$56		X								X		

BLUE = Project located in South Carolina

Capital $ in Thousands

					Transmission System Intelligence				Transmission Hardening & Resiliency						Phys & Cy Security	
Project ID	**SC DEP Project Name**	**2019**	**2020**	**2021**	**Sys Intel & Monitoring**	**Digital Relay**	**Remote Sta. Monitor**	**Remote Cntl Switches**	**44kV System Upgrades**	**Network Radial Subs**	**Sub. Flood Mitigation**	**Target Line Rebuilds**	**TX Bank Replace**	**T/D Oil-Gas Breakers**	**Physical Security**	**Windows Based Units**
F170718B	Fort Bragg Main 230kV - SB17 Work			$1		X										
F171002A	Blewett H.E. Plant - SB17 Work					X										
F160118E	Milburnie 230kV & Roxboro Plant - R	$134				X	X							X		
F160617C	Havelock 230kV - Add Redundant Bus	$653				X	X							X		
F160617D	Jacksonville 230kV - Add Redundant	$23				X	X							X		
F160617E	Asheboro 230kV - Add Redundant Bus	$359				X	X							X		
F160617F	Wommack 230kV - Add Redundant Bus D	$202				X	X							X		
F160617G	Fayetteville 230kV - Add Redundant	$2,264	$31			X	X							X		
F160617H	Florence 230kV - Add Redundant Bus	$2,117	$469			X	X							X		
F160617I	Asheboro 230kV - Add 115kV Bus Tie	$4					X							X		
F170217C	Falls 230kV - Add Bus Tie Breaker 2	$530					X							X		
F170222A	Richmond 500kV - Add Redundant Bus	$219	$184	$522		X	X									
F170222B	Lee 230kV - Add Redundant Bus Diff	$2	$126	$734		X	X									
F170324A	Rockingham 230kV - Add Redundant Bu	$259	$1,425	$2		X	X							X		
F170727A	Laurinburg 230kV - Add 2nd 115kV Bu	$1,095	$2				X							X		
F20100086	Raeford 230kV Sub Temp Line Relo (O	$261	$1				X						X	X		
E180065	Brunswick SE Plt - Uprate the Jacksonville 230 kV Line						X									
F170804A	New Bern 230kV - Install Breaker an			$435		X	X							X		
F140605G	MAYO SEP-RELYAS	$9				X										
F150112A	Wilson 230-Instl CBM 230/115kV Auto	$5			X											
F150211B	Kinston Dupont 230kV - Repl SLY Rel	$33				X										
F150211D	Morehead Wildwood 230kV - Repl DFR,	$6				X	X							X		
F150305A	BNP U2 - Upgrade Relay Protection f	$483				X										
F150211C	Cane River 230kV - Repl SLY Relays,		$115	$782		X	X							X		
F170208A	BNP U1 - Upgrade Line Protection, Mo		$172	$419		X										
17CBMKEL	Installation of Kelman CBM Durham a				X											
F150305B	BNP U1 - Upgrade Relay Protection f					X										
E180029	Biscoe 230 Replace DFR			$98	X											
F140618T	Dovesville Nucor 230-Relay protect					X	X							X		
F140908A	Camden 230kV-Rpl relay pnls/Carr/CC				X	X										
F140618X	Shaw Field 115kV - Add Differential					X										

BLUE = *Project located in South Carolina*

Capital $ in Thousands

					Transmission System Intelligence				Transmission Hardening & Resiliency						Phys & Cy Security	
Project ID	**SC DEP Project Name**	**2019**	**2020**	**2021**	**Sys Intel & Monitoring**	**Digital Relay**	**Remote Sta. Monitor**	**Remote Cntl Switches**	**44kV System Upgrades**	**Network Radial Subs**	**Sub. Flood Mitigation**	**Target Line Rebuilds**	**TX Bank Replace**	**T/D Oil-Gas Breakers**	**Physical Security**	**Windows Based Units**
F140619K	SUM-SCE&G CANDYS-INST REMOTE SECTLZ			$3			X	X								
F140619W	WATEREE HEP-ADD REMOTE TLINE HLT CA						X									
F170517A	Clinton North 115kV - Add Superviso			$4		X	X							X		
F170517B	Fremont 115kV - Add Supervisory Con			$5		X	X							X		
F170517C	Kornegay 115kV - Add Supervisory Co			$4		X	X							X		
F140211D	SUMTER-SCEG EASTOVER-REPL OHGWU19	$1,596	$1,899									X				
F140609A	Bennettsville SS-Laurinburg 230kV-R	$					X	X								
F140609F	Henderson - VEPCO Carr Dam Plant 11	$79										X				
F160216A	Henderson-VEPCO Kerr Dam Plant 115k	$973					X	X								
F170117A	Lee Sub-Milburnie 230kV - Repl Sw 7	$29					X	X								
F140218T	WEATHRESPOON-RAEFORD-REPL OHGW		$4,112									X				
F140609E	Raeford 230kV - Replace Deteriorate		$578	$1								X				
F140609R	Blewett Falls Plant-Tillery Plant 1		$4,651									X				
E180027	Lee Sub-Wallace 115 Replace Cap and		$559	$4			X	X								
E180019	Kingstree-Sumter Repl sw 109 and 111 with remote sw		$5				X	X								
F20081182	CAMDEN JCT 115 SS- Replace Line Rel					X	X							X		
F150216A	Lee Plt-Goldsboro 115kV N - Repl Sw						X	X								
E180007	Erwin-Fayetteville 115 Replace Swit			$360			X	X								
E180010	Clinton - Vander 115 Replace sw 267			$360			X	X								
F170905I	Skyland 115kV - Rebuild Substation			$3,464	X	X	X						X	X		
F160115B	Cane River-Craggy 115kV - Repl Sw 1						X	X								
F140605B	MILBURNIE-WAKE-ADD SWITCHES						X	X								
F170217B	Aurora-Greenville 230kV - Add RC to						X	X								
F170217A	Craggy-Vanderbilt 115kV - Repl Sw 1						X	X								
E180005	Lee Plant-Black Creek East 115 repl			$360			X	X								
F170214A	Biscoe-Rockingham 230kV - Repl Sw 5						X	X								
F171025A	Method-Milburnie South 115kV - Relo	$295										X				
F140618R	SUTTON-DELCO -REPL WOOD H FRAMES	$4										X				
F160914A	Folkstone-Jacksonville City 115kV -		$7,492									X				
F160623D	Goldsboro-Wommack 115kV - Repl Sw 1		$564	$			X	X								
F160323A	Durham-Method 230kV - Repl Sw 461-2		$344	$				X								

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					Transmission System Intelligence				Transmission Hardening & Resiliency						Phys & Cy Security	
Project ID	**SC DEP Project Name**	**2019**	**2020**	**2021**	Sys Intel & Monitoring	Digital Relay	Remote Sta. Monitor	Remote Cntl Switches	44kV System Upgrades	Network Radial Subs	Sub. Flood Mitigation	Target Line Rebuilds	TX Bank Replace	T/D Oil-Gas Breakers	Physical Security	Windows Based Units
F140620V	MILB-MORDECAI 115 REB LINE SECTION		$392	$1								X				
F140620C	ASHEBORO S-REPL WOOD STRUCTURES		$994			X							X	X		
F150428A	Erwin-Fay 115kV-Repl Sws 173 & 173-						X	X								
F140620D	CAPE FEAR PLANT-METHOD 115KV- REPL STRUCTURES			$1,212								X				
F140620E	Roxboro Plant-DPC E Durham 230kV West Sw at Bahama Tap						X	X								
E180031	ASEP - OTEEN 115KV East-Emergent Re			$99			X	X								
F140917B	Sutton-Delco 230kV - Repl Strs at Plant on River Crossing											X				
F170226C	Franklinton-Spring Hope Sw Sta 115k			$106			X	X								
F140619P	ROCKY MT-WILSON 115-REPL OHGW			$178								X				
F170226B	Harris Plant-Erwin 230kV - Install			$4			X	X								
F160323B	Aurora-Greenville 230kV - Repl Str			$32								X				
F170612A	Cane River-Craggy 115kV - Install D						X	X								
E180069	Chestnut Hills - Milburnie 115kV -		$111	$8,529								X				
	TOTAL - DEP - NC & SC	**$35,011**	**$147,178**	**$99,323**												

Oliver Exhibit 9

Duke Energy South Carolina Grid Improvement Initiative Workshop Report

September 6, 2018

Prepared by Rocky Mountain Institute

Contact: Jason Meyer, jmeyer@rmi.org

Table of Contents

Executive Summary

Duke Energy[1] hosted a technical workshop on August 14th, 2018 regarding the Company's South Carolina Grid Improvement Initiative to explain the need for and ongoing benefits of grid investments, and to hear feedback from stakeholders in attendance.

Acting as a neutral facilitator, a team from Rocky Mountain Institute (RMI) convened 57 participants (inclusive of 17 Duke Energy and 5 RMI staff) for an afternoon workshop that included content presentations, structured feedback sessions, and facilitated small group breakout sessions. RMI captured detailed notes for all small group and plenary discussions, and conducted an anonymous post-event survey among non-Duke Energy, non-RMI attendees to gather stakeholder feedback.

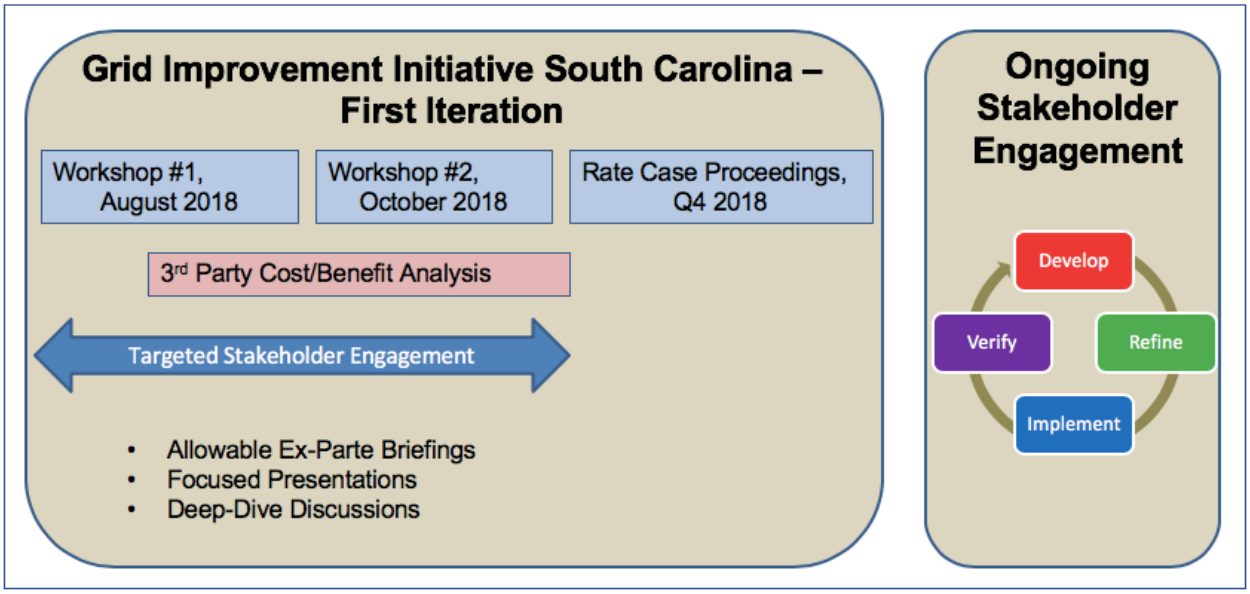
This document provides a record of the day's activities and outcomes, as well as a summary of survey results. This document contains an anonymized synthesis of what was shared by participants, and does not attribute specific comments to specific parties, in order to respect the ground rules agreed to by participants at the beginning of the meeting. Specifically, participants agreed that what was discussed at the workshop could be shared publicly, but specific comments could not be attributed to individuals without their permission.

Workshop Context

This workshop is part of an ongoing stakeholder engagement process for the South Carolina Grid Improvement Initiative. As Duke Energy shared at the beginning of the workshop (see Figure ES-1), Duke Energy intends to file a rate case related to grid improvement, before the end of the fourth quarter in 2018. The feedback collected from this workshop will be incorporated into Duke Energy's subsequent analysis and further development of the grid improvement initiative. In October, Duke Energy will host a second workshop to share any evolved plans for grid improvement, and explain how stakeholder feedback from the first workshop has been incorporated.

[1] References to Duke Energy are intended to describe the joint efforts of the two separate and distinct utilities, Duke Energy Carolinas, LLC and Duke Energy Progress, LLC, both of which operate in South Carolina as well as North Carolina.

Figure ES-1: Stakeholder Engagement Strategy presented by Duke Energy



Workshop Objectives

The workshop was organized around three objectives, as listed below. RMI developed these objectives in consultation with Duke Energy and other participants interviewed in advance of the event.

In order to engage stakeholders in Duke Energy's current plans for grid improvement, the workshop was designed to meet the following objectives:

- **Objective 1:** Develop stakeholder understanding of the initiative;
- **Objective 2:** Listen to and explore stakeholder feedback; and
- **Objective 3:** Lay the groundwork for a collaborative process moving forward.

Key Workshop Outcomes

Several high-level themes emerged from the conversations during the workshop and in the post-event surveys as key outcomes and takeaways for future action. They are described below, with supporting detail in the subsequent sections of this report.

These themes do not necessarily represent the views of RMI, Duke Energy, or any specific attendees, nor do they represent consensus among participants. Rather, we reflect the range of feedback, as well as common themes that arose in multiple conversations during the workshop, for consideration by Duke Energy and other stakeholders as they design a collaborative process moving forward.

- **Familiarity and knowledge about the Grid Improvement Initiative varied widely among stakeholders.**
- **Participants would like to understand more of Duke Energy's quantitative and qualitative goals for grid improvement.** In the Q&A sessions following Duke Energy's presentation and the breakout sessions, participants raised questions around what the performance goals are, in particular beyond reliability. They suggested that Duke Energy conduct further conversations with stakeholders to assess if Duke Energy's goals align with the needs and priorities of customers and understand customer's willingness to pay for reliability.
- **Participants would like to learn more details regarding how Duke Energy is planning to allocate capital among grid improvement investments.** Participants raised questions in both plenary and breakout sessions regarding Duke Energy's plan of prioritizing among various investments.
- **Participants provided input regarding options and considerations they would like Duke Energy to include in the cost-benefit analysis.** Those requests were not all aligned and not all mutually exclusive, but generally include:
    - Compare the relative cost/benefit of different investment options (and share/discuss the rationale around tradeoffs) for each utility.
    - Disaggregate the benefits by each customer class, and allocate cost accordingly for each utility.
    - Be more comprehensive in the options that are being considered in the cost/benefit framework; for example, analyze a baseline scenario of "doing nothing", analyze scenarios with different adoption level of DERs in the distribution system, etc.
    - Maintain flexibility to accommodate additional investment paths or new regulatory frameworks in the future, potentially accommodating performance-based metrics.

Workshop participants discussed a wide range of actions for Duke Energy to take as immediate next steps following the workshop, including:

- **Participants offered to provided analyses/resources to support Duke Energy in developing the Grid Improvement Initiative over the next month.** The offers range from system planning analyses, economic impact studies, to business model reform metrics, and facilitation support. The full list can be found in Appendix 1.

- **Participants recommended Duke Energy continue educating and engaging key stakeholders, with a particular focus on:**
    - Engaging missing or underrepresented perspectives; for example, residential customer representatives and low-income/rural communities.
    - Providing easy-to-access information for stakeholders that are not familiar with the Grid Improvement Initiative.
- **Participants recommended that Duke Energy engage targeted stakeholders in working groups discussions before the end of the year, for the purposes of:**
    - Communicating proposed cost/benefit and trade-off rationales.
    - Understanding and aligning on the methodology and key inputs/assumptions for the cost/benefit analysis.
    - Understanding and aligning on priorities around grid reliability.

Workshop Activities and Attendee List

RMI consulted with both Duke Energy and other participants in pre-workshop discussions; RMI incorporated feedback from these discussions to refine the meeting objectives and design the workshop agenda to best meet these objectives. The workshop agenda as executed is included below in Table 1.

Table 1: Aug 14 Technical Workshop Agenda

Time	Activity	Objectives addressed
12:30	Welcoming remarks	
12:40	Overview of Duke Energy's proposed engagement approach	#1
12:45	Check-in and introductions	
13:10	Activity: Four ways of talking and listening	#3
13:30	Presentation (RMI): National grid modernization context	#1
14:00	Presentation (Duke Energy): Understanding the SC Grid Improvement Initiative, cost/benefit and cost effectiveness framework, and Q&A	#1, #2
15:00	Break	
15:15	Activity: Breakout group discussions for feedback	#1, #2, #3
16:45	Report-out and reflections from breakout groups	#2, #3
17:30	Closing remarks and adjournment	

A total of 57 participants attended the technical workshop, including 17 participants from Duke Energy and 5 from RMI. A full list of attendees is included below in Table 2.

Table 2: August 14 Technical Workshop Attendees

Last Name	First Name	Organization
Barton	Jim	FUJIFILM Manufacturing
Beaufort	Cleve	BMW Manufacturing Co., LLC
Billimoria	Sherri	RMI
Boyt	John	Central Electric Power Cooperative Inc.
Brooks	Jeff	Duke Energy
Burnett	John	Duke Energy
Carter	Ron	North Eastern Strategic Alliance
Chan	Coreina	RMI
Claunch	Chuck	Duke Energy
Culley	Thad	Vote Solar
Cummings	Bill	SCEUC-Chair-Kimberly Clark
Davidson	Hilary	Duke Energy
Davis	Hamilton	Southern Current
Dohn	Steffanie	Southern Current
Dover	Becky	SC Department of Consumer Affairs
Dr. Von Nessen	Joey	University of South Carolina
Echevarria	Sidney	Duke Energy
Elliott	Scott	SCEUC Attorney-Elliott & Elliott
Ferguson	Stinson	SELC
Ghartey-Tagoe	Kodwo	Duke Energy
Gilliam	Joi	SC Department of Commerce
Golin	Caroline	Vote Solar
Hall	Karen	Duke Energy
Haynes	Rebecca	Conservation Voters of South Carolina
Hazzard	Sara	South Carolina Manufacturers Alliance
Hipp	Dawn	South Carolina Office of Regulatory Staff (ORS)
Holeman	Blan	SELC
Jacob	Bryan	Southern Alliance for Clean Energy (SACE)
Jiran	Rick	Duke Energy
Johnson	Sarah	South Carolina Office of Regulatory Staff (ORS)
Knapp	Frank	Small Business Chamber of Commerce
Kruse	Susan	Duke Energy
Lawyer	Robert	South Carolina Office of Regulatory Staff (ORS)
Li	Becky	RMI
Li	Richard	RMI
Martin	Jason	Duke Energy
McKay	Jeff	North Eastern Strategic Alliance
Meyer	Jason	RMI
Moore	Eddy	Coastal Conservation League
Morgan	Willie	South Carolina Office of Regulatory Staff (ORS)
Motsinger	Scott	Central Electric Power Cooperative Inc.
Palmer	Miko	Duke Energy
Preston	Marcus	Duke Energy
Robbins	Shelley	Upstate Forever
Rogers	David	Sierra Club
Ruhe	Mike	Duke Energy
Sandonato	Anthony	South Carolina Office of Regulatory Staff (ORS)

Seaman-Huynh	Michael	South Carolina Office of Regulatory Staff (ORS)
Sharpe	Chris	Duke Energy
Shirley-Smith	Heather	Duke Energy
Simpson	Bobby	Duke Energy
Sipes	Robert	Duke Energy
Smith	Robert	MVA Nucor
Tynan	John	Conservation Voters of South Carolina
Wall	John	South Carolina Manufacturers Alliance
Wislinski	Benton	BGW Solutions
Yawn	George	Resolute Forest Products

Workshop Outcomes

The following sections outline the workshop activities, common themes of discussion, and survey outcomes associated with each of the three workshop objectives. RMI developed these summaries based on notes taken during the workshop as well as on the results of the anonymous survey distributed to participants (excluding Duke Energy and RMI staff) afterwards. Due to the low response rate to the survey (49%), survey outcomes should be interpreted with caution.

The summaries of common themes were not necessarily endorsed by every participant within the workshop, nor are they necessarily the recommendations of RMI or Duke Energy.

Objective 1: Develop stakeholder understanding of the Grid Improvement Initiative in South Carolina

Activities

RMI designed several sections of the agenda to allow for explanation of the need for and benefits of grid investments:

- A presentation from RMI (see Attachment 2) reviewed grid modernization trends across the nation, to contextualize the Grid Improvement Initiative. The presentation outlined both the content of proposals across the country (e.g., specific investment, regulatory, and operational approaches to grid modernization) as well as processes used by utilities, regulators, and other stakeholders to reach alignment.

- Duke Energy provided participants with presentations and handout materials to explain the high-level plans for the Grid Improvement Initiative, including the following:
    - A presentation from Duke Energy (see Attachment 3) covered the unique factors in South Carolina that form the basis for the proposed Grid Improvement Initiative. The presentation was derived from a white paper (see Attachment 4) that Duke Energy developed earlier this year, which was distributed at the workshop before the presentation. After the presentation, participants had a chance to ask clarifying questions that were answered in real time by Duke Energy representatives (see Appendix 2).

- A handout from Duke Energy (see Attachment 5) outlining the process for evaluating cost/benefit and cost effectiveness for a particular course of action.
  - At the workshop, RMI asked participants to spend a few minutes reading through the cost/benefit and cost effectiveness framework; participants also had a chance to ask clarifying questions that were answered in real time by Duke Energy representatives (see Appendix 2).
  - This cost/benefit and cost effectiveness handout also set the stage for the subsequent discussions of the workshop, providing a framework for participants to provide feedback which was summarized in detail as common themes under Objective 2.

Cost/Benefit and Cost Effectiveness Framework

This framework can be conceptualized as a decision tree, summarized as follows:

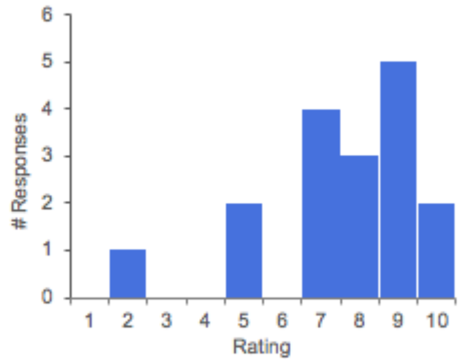
- Cost Benefit Analysis:
  - "Go/No Go" Level: Determine if a course of action should be taken. Proceed if the course of action is either mandatory for compliance, or justified by its clear demonstrated benefit to customers, Duke Energy, or third parties.
  - "Path Selection" Level: Determine if a particular path to achieve this course of action should be taken. Proceed if the chosen path is the only viable option, or more favorable than other paths on a net present value basis, or justified by other qualitative factors that are objective and provable.
- Cost Effectiveness Analysis: Prove that the chosen path will be executed in a reasonable and prudent fashion. Proceed if the execution plan leverages competitive bidding, optimizes work mobilization, identifies risks and contingencies, and implements metrics for evaluating progress.

- A handout from Duke Energy (see Attachment 6) outlining the definition of *maintain base* vs. *incremental* transmission and distribution system work. This handout material was not discussed in detail at the workshop.

Outcomes

Most survey respondents indicated that the workshop improved their understanding of Duke Energy's proposed grid investments, but a few respondents indicated that the workshop did not present substantial new information over what they already understood.

Figure 1: Survey responses: "How well did this workshop enhance your understanding of the proposed Grid Improvement Initiative?"



The post-event survey asked participants "How well did this workshop enhance your understanding of the proposed Grid Improvement Initiative?" Participant answers are shown above in Figure 1. On a scale of one to ten, 82% of respondents answered with a score of seven or higher.

- In comments, one respondent requested more details on Duke Energy's specific analyses, goals, and assumptions of metrics. Another respondent suggested the workshop could incorporate more discussion and fewer formal presentations.
- One of the outliers, who provided a score of 2, indicated in their comments that they already "had a very deep understanding" of the Grid Improvement Initiative.

Objective 2: Listen to and explore stakeholder feedback to the Grid Improvement Initiative in South Carolina

Activities

The agenda was designed to encourage open discussion of participant feedback.

- Following Duke Energy's presentation on the Grid Improvement Initiative, participants asked clarifying questions that were answered directly by Duke Energy's representatives. Participants also asked clarifying questions and provided feedback on the cost/benefit framework, which served to guide the discussion in subsequent activities.
- In addition to the opportunity to share feedback in plenary discussions, breakout sessions provided extensive opportunities for stakeholders to share feedback on the proposed grid investments. Specific discussions hosted in each breakout session, outlined below, allowed participants to raise points of feedback:
    - Breakout question 1: "What criteria or investments are most important to you to include in a modernized grid? How do you define/articulate their values?"
        - Participants shared feedback on the goals of grid improvement and the prioritization of investments to achieve those goals.
    - Breakout question 2: "What key options should be compared in a cost/benefit analysis?"
        - Participants shared feedback on the cost/benefit analysis framework, suggesting additional functionalities, identifying potential scenarios for analysis, and requesting points of clarification.

Common Themes

Key points of feedback from participants centered around the scope and prioritization of grid improvement investments, considerations around the cost/benefit analysis, and customer needs around reliability.

- **Participants suggested Duke Energy first identify clear goals and objectives for the Grid Improvement Initiative before selecting investments.** Key perspectives voiced include:
    - To gauge the success of projects in addressing these goals, Duke Energy should define clear and tangible metrics, such as a certain percentage reduction in SAIDI.
    - Initial stakeholder engagements can serve to vet the goals and objectives, and understand the complementary or competing needs of different customer groups.

- After reaching consensus on a set of goals, Duke Energy should conduct cost/benefit analysis on potential investments to assess and compare the ability of each utility to effectively meet these goals.

- **Participants suggested Duke Energy and stakeholders achieve better mutual understanding of priorities, concerns and willingness to pay for grid investments.**
  - *Understand the prioritization of grid improvement investments from the perspectives of both Duke Energy and each utility's customers*
    Key perspectives voiced include:
    - Participants would like to better understand how Duke Energy will prioritize investments within the Grid Improvement Initiative.
    - Duke Energy should hold focus groups with different customer classes to understand what they want and value.
    - While some participants acknowledge that investments may provide different value to different customers, others stated that investments should benefit all customers.

    Duke's discussion points included:
    - Duke Energy is focusing on projects with clear net present value benefits, such as targeted undergrounding and distribution system hardening.
    - Duke Energy will distinguish grid investments that are indispensable for all customers from those that benefit select customers. Since most investments fall into the latter category, Duke Energy plans to prioritize projects that maximize benefits across the majority of customers.
  - *Cybersecurity, reliability, and foundational data capabilities are among top stakeholder concerns.*
    - There was broad consensus that cybersecurity is one of the top concerns amongst stakeholders.
    - Hardening, resilience, and automation of power restoration can eliminate or reduce the impact of predictable outages, such as those caused by weather.
    - Duke Energy should invest in foundational data capabilities to inform future investments and rate design. This may include smart meters, sensors, and improved grid communications investments.
  - *Duke Energy should assess customers' willingness to pay for reliability.*
    Key perspectives voiced include:
    - Duke Energy should engage customers of all classes to determine their willingness to pay higher rates for reliability.

- If reliability is the sole goal or desired benefit of grid improvement, Duke Energy should more clearly and transparently convey the goals of grid improvement.
- One proposed way to gauge consumer interest is through a survey, although there were mixed opinions about how effective this would be.

- **Participants offered diverse suggestions for refinement of the cost/benefit framework.**
  - *Additional functionality of the cost/benefit framework could include:*
    - The cost/benefit framework presented by Duke Energy is only designed to evaluate one single project, and not equipped to compare the relative cost/benefit of different investment options.
      - Duke Energy acknowledged the need to compare benefits of individual investments, as well as take into account the potential stacking of benefits across investments.
    - The current cost/benefit framework appears to be a global analysis, which does not appropriately allocate cost over different customer classes.
      - For example, the 98% of outage costs are borne by businesses (as stated in Duke Energy's white paper), but targeted undergrounding investments primarily benefit residential customers.
      - Duke Energy should fairly allocate costs by benefit for each customer group, and clearly articulate this process in version 2.0.
  - *Potential scenarios by which the cost/benefit framework could be applied include:*
    - Compare the cost/benefit of transmission and distribution-level investments with customer-facing programs such as demand-side management, energy efficiency, demand response, and DERs.
    - Trade-off analysis should be conducted for the seven programs in version 1.0. For example, compare the cost/benefit of targeted undergrounding investments with alternatives that can achieve the same reliability goals, such as self-optimizing grid.
      - Duke Energy should provide clarity on how it is optimizing between different, and potentially competing categories, such as reliability and customer choice.

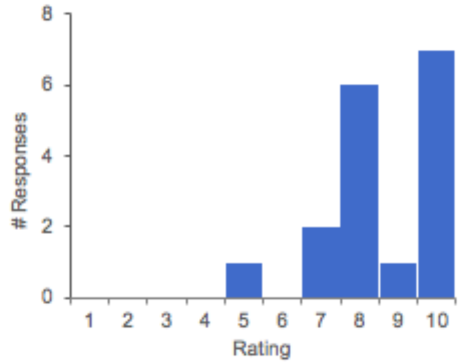
    - Scenario: Identify the cost/benefit of maintaining current reliability metrics, or "doing nothing." This establishes a baseline to establish the need for grid improvement investments.
    - Scenario: Perform cost/benefit analysis assuming 50% of generation will be on the distribution system within 10 years. This projects a future grid scenario with aggressive adoption of non-wire alternatives and customer-owned assets.
  - *Considerations around maintaining flexibility of investment paths include:*
    - Investments should be flexible and support evolution of technology over time. Instead of locking each utility into one course, grid improvement investments should accommodate long-term changes.
    - As states consider alternative regulatory frameworks, cost/benefit analysis should be able to accommodate evolving criteria for the performance of each utility. For example, cost/benefit analysis should be assessed against performance-based metrics, or take into account non-financial benefits such as community and environmental impacts.
  - *Requests for clarification from Duke Energy on the cost/benefit framework include:*
    - Specify the timeline of the cost/benefit analysis. Certain scenarios, such as DER deployment to defer generation investments, may cost more in the short-term but provide cost savings over a longer time horizon.
    - Provide more clarity and transparency around the inputs and assumptions that go into the cost/benefit analyses. This would provide a common foundation for stakeholders to speak/provide input on the technical aspects of cost/benefit analyses.

- **Participants suggested Duke Energy enable more distributed resources through integrated system planning.**
  - Duke Energy should enable more distributed energy resources (DERs) to defer generation investments, reduce carbon emissions, and lower customer bills in the future.
  - Integrated distribution resource planning and hosting capacity analysis can enable more DERs, while also providing more rate options and transparency to customers.

Outcomes

A majority of survey respondents indicated they were satisfied with the opportunity to provide feedback and dialogue with Duke Energy staff and other participants.

Figure 2: Survey responses: “How satisfied are you with the opportunity to provide feedback and dialogue with Duke Energy?”



The post-event survey asked participants, “How satisfied are you with the opportunity to provide feedback and dialogue with Duke Energy?” The average score given was 8.6 out of 10, as shown in Figure 2. Quotes from survey respondents indicate a broad appreciation of the opportunity to provide feedback to and discuss with Duke Energy:

- “Useful to communicate with Duke and other stakeholders in the same room”
- “Small group discussions were good”

The individual who gave a score of 5 did not provide any explanatory comments.

Objective 3: Lay the groundwork for a collaborative process moving forward

Activities
Throughout the workshop, Duke Energy addressed a few topics related to the collaborative stakeholder engagement process, including:

- Timeframe of the next workshop and rate case filing. At the start of the workshop, Duke Energy stated its plan to host a follow-up workshop in October 2018, where Duke Energy representatives will present what they learned from this past workshop and how they incorporated the group's feedback. This subsequent workshop will also precede Duke Energy's rate case filings, which are intended to occur before the end of Q4 2018.
- Lessons learned from the stakeholder engagement process in the North Carolina Power/Forward initiative (see Appendix 2). Duke Energy stated its intent to more clearly communicate the goals of grid improvement, better understand what customers want, demonstrate the value proposition through cost/benefit analysis, and work with stakeholders to gather input prior to filings.
- The RFP process for a third-party to conduct cost/benefit analysis. Duke Energy announced that it is selecting a third-party vendor to conduct cost/benefit analysis on proposed grid improvement investments. Duke Energy emphasized that the consultant is being asked to challenge, not simply validate, Duke Energy's proposals.

Several activities within the agenda focused on considerations for setting up an effective collaborative process, useful both for the upcoming rate case filings and for future collaborative opportunities.

- The workshop started with a "four ways of talking and listening" activity (see Appendix 2), where participants reflected on different ways of communicating for more effective collaboration.
- Two of the breakout group topics also discussed a possible set of next steps to guide a more collaborative planning process moving forward, with summaries below:
    - Breakout question 3: "What analyses or inputs can you provide to Duke Energy to support developing these plans before the end of Q3?"
        - Participants offered to provide analyses to support and complement Duke Energy's own analyses prior to the next stakeholder engagement in October.
    - Breakout question 4: "What kinds of discussions do you suggest Duke Energy host or participate in before the end of Q4?"
        - Participants provided feedback on the timeline, meeting design, and stakeholder representation in future engagements.

- In the long-term, Duke Energy expressed the intent to continue an ongoing stakeholder engagement process, emphasizing that the Grid Improvement Initiative "is a marathon, not a sprint."

Common Themes

Workshop participants proposed a variety of analyses/input for Duke Energy to consider, as well as recommendations for Duke Energy's immediate next steps, including inclusion of more representatives of residential customers and low-income communities, and more targeted engagement with smaller, more functional working groups.

- **Participants offered to provide a wide range of analyses to Duke Energy to inform grid investments.**
    - Several participants offered to provide analyses that their organizations have conducted to support Duke Energy in the Grid Improvement Initiative. These analyses range from system planning analysis, economic impact data, DER integration guidelines, and outage impact studies. The full list of services offered, along with their points of contact, are listed in Appendix 1. By incorporating these analyses from other stakeholders, Duke Energy can validate findings, as well as calibrate the assumptions that go into Duke Energy's analyses.

- **Participants suggested future meetings include representatives of residential customers.**
  Key perspectives voiced include:
    - Future stakeholder engagements should include more residential customers or organizations representing residential customers.
    - In particular, rural and low-income customers should be consulted on targeted undergrounding investments, assuming they would benefit most from distribution system hardening.
    - One survey respondent suggested Duke Energy to "go beyond the usual suspects," and engage organizations such as AARP and the League of Women Voters.
    - While several organizations representing residential customers were invited to this workshop, only a few were able to attend.

- **Participants suggested particular timeline and meeting design for stakeholder engagement.**
  Key perspectives voiced include:
    - Duke Energy should circulate a preliminary set of changes or amendments of the proposed grid investments for comments in

September. That way, participants can offer feedback prior to the subsequent workshop in October.
  - ○ Future stakeholder engagements could be more effective with smaller, more functional working groups. This would allow for more targeted discussion around specific areas of the proposal, with stakeholders actively engaged in the topic.

Outcomes

Survey respondents overwhelmingly indicated interest in continuing to engage with Duke Energy on grid improvement planning, and a majority stated that the workshop provided an effective foundation for future collaboration.

Figure 3: Survey response: "How willing are you to engage in future follow-up conversations with Duke Energy around the proposed Grid Improvement Initiative?"

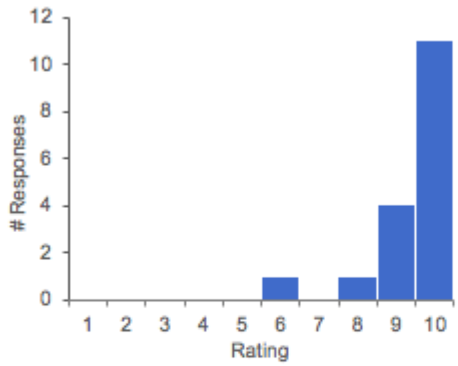
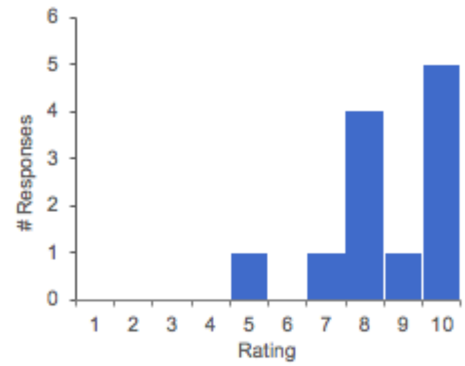


Figure 4: Survey response: "How effective was this workshop in providing a foundation for new kinds of conversation and collaboration going forward?"



The post-event survey asked "How willing are you to engage in future follow-up conversations with Duke Energy around the proposed Grid Improvement Initiative?" Participants responded with an average score of 9.4 out of 10, indicating significant interest in continuing to engage; see Figure 3 above.

- There was one individual who gave a score of 6, but they did not provide comments.

In addition, in response to the question "How effective was this workshop in providing a foundation for new kinds of conversation and collaboration going forward?", respondents gave an average score of 8.6 out of 10; see Figure 4 above.

- The majority of respondents (83%) provided of 8 or higher, sharing comments such as "good starting point, can't wait to see how it moves forward."
- One individual provided a score of 5, requesting "more technical expertise" at future workshops.

Appendix 1: Breakout discussion notes

Participants were instructed to split up into seven small groups to discuss their responses to four breakout questions. The full notes captured from each group's flipcharts are presented below, with annotations for context and clarity in blue. Also included is a summary of common themes that surfaced among different groups. The number of groups in which a particular theme surfaced is recorded in [brackets].

Breakout discussion #1

Question 1: What criteria or investments are most important to you to include in a modernized grid? How do you define/articulate their values?

Common themes from flip chart notes, with number of occurrences in [brackets]:

- Enabling higher DER penetration, to defer new generation [x4]
- Cybersecurity [x3]
- Determine value of investments for different customer groups, and allocate costs accordingly: [x3]
  - Perspective 1: All customers should benefit from investments
  - Perspective 2: Values are different for different customers
- Integrated system planning, which can be more cost-effective and provide more options and transparency [x2]
- Establish foundational data capabilities to inform future investments and rate design. This may include smart meters, sensors, and communications systems. [x2]
- Improve reliability by reducing voltage sag, deploying hardening & resilience measures, and automating power restoration. Eliminate predictable weather-related outages. [x2]
- Investments should be flexible and enable or support evolution of technology. Instead of locking into one course, investments should accommodate long-term changes.
- Provide customer more rate options, value, and transparency and control in managing their bills.

Full notes captured from flipcharts as below, with annotations in blue:

Table A1: Breakout discussion #1 full notes

Group #	Full Notes
1	• Security from cyber threat • Accommodation and enabling of DER & storage: at the residential, industrial, and utility-scale; leveraging PURPA (Public Utility Regulatory Policies Act) ○ The value of DERs includes non-energy benefits • Rate equity across customer classes • Transparency on customer bill; breaking down bill to reflect cost of service, i.e. 50% from generation costs, 50% from transmission costs • Determine what different customer classes want & value – more customer focus groups across customer classes
2	• EV penetration • DER penetration • Integrated system planning • Customer deliverables: enabling choices, providing value

3	• Invest in strong, integrated distribution resource planning (IDRP) & hosting capacity analysis
	  ○ The value of an IDRP includes:
	    ■ Better tool to plan for the grid
	    ■ Ability to be more cost effective
	    ■ Provides more options with rates
	    ■ Transparency, particularly with regard to rate-based assets
	    ■ Optimize for a more dynamic grid. Data can be used to determine best places for investments.
	• Better define "grid modernization" vs. "routine capital investment"
	  ○ The value of making this distinction includes:
	    ■ Common understanding amongst stakeholders of investment in grid modernization
	    ■ Helpful with cost recovery efforts

4	• Reduction in energy usage and peak demand (to save customers money)
	• Enable customer DERs: distributed generation, demand response, and energy efficiency
	• Cybersecurity
	• Enhanced customer education and engagement on energy usage, to allow customers to better control their energy bills
	• The value of the above investments includes:
	  ○ Reduction in carbon emissions
	  ○ Reduction in customer bills (long-term)
	  ○ Values are different for different stakeholders

5	• Improved reliability, by:
	  ○ Perfect power
	  ○ Reducing voltage sag
	  ○ Hardening & resilience to strengthen against weather-related outages
	• Eliminate repeat/predictable outages (such as those caused by weather)
	• Invest in incremental improvements, not just maintenance:

	○ Smart meter deployment ○ Communication upgrades ○ Self-healing grid ● Better communications to facilitate improved rate design ○ Communication upgrades would provide more data to make decisions ● Make flexible investments that do not lock the Grid Improvement Initiative into one course, but instead accommodate long-term changes ○ An indicator of whether an investment provides flexibility is if it enables/supports evolution of technology. ● Access to cheap, clean energy
6	● Establish appropriate price signals for customers to shift peak system demand ● All customers should benefit from the investments ● Establish foundational data capabilities to support analytics that drive future investments ● Grid investments that enable more clean energy ● Duke SAIFI down, SAIDI up [Duke Energy has experienced a decreased frequency of interruption, but an increased average duration per event] ● Reduce response time to outages ● Reduce truck rolls for outage restoration through system automation – on the transmission system as well as the distribution system ● Cybersecurity: advocate for federal dollars
7	● Transmission improvements, which affect all customer groups ● (Criteria need to be) measurable ● How to enable deferral of new generation

Breakout discussion #2

Question 2: What key options should be compared in a cost/benefit analysis?

Common themes from flip chart notes, with number of occurrences in [brackets]:

- Define cost allocation by benefit for customer classes [x3]
  - Global analysis does not yield accurate cost/benefit analysis because different customers are affected differently
- Perform trade-off analysis of seven programs in version 1.0 [x2]
  - Optimize between different and potentially competing categories, such as reliability & customer choice
- Maintain flexibility to accommodate new technologies in the long-term [x2]
- Provide transparent market-based analysis, and show numbers [x2]
- Define the timeline of cost/benefit analysis. Compare short-term and long-term scenarios, for options such as deferred generation [x2]

- Consider the non-financial benefits, such as benefits to the community and environment
- Participants offered different suggestions for what Duke Energy should prioritize in the cost/benefit analysis:
  - Non-wire alternatives over reliability [x2]
  - Customer-owned resources (solar, EV)
  - PB metrics
  - encourages new market participants,
  - Enable max deployment of renewables/EE
  - Customer options (Nest, TOU, pay as you go).
- Scenarios:
  - 50% generation is on distribution system within 10 yrs
  - Compare with customer programs (DSM, EE, DR, DERs)
  - Alternatives to TUG (expanding redundancy in distribution network)
  - C/B of maintaining current reliability (doing nothing)
- Layered benefits
- Metrics: SAIDI/SAIFI are not sufficient. Cascading impacts

Full notes captured from flipcharts as below, with annotations in blue:

Table A2: Breakout discussion #2 full notes

Group #	Full Notes

1	• C/B analysis should have ability to assign costs accurately between classes
	  ○ For example, PFC has 7 strategic programs but only 1 is transmission-related – how does this benefit wholesale customers?
	• Compare short-term vs. long-term benefits & costs
	  ○ For example, deferred generation may cost more in the short run but be cheaper and more sustainable in the long run
	• Identify best bang for the buck
	• Consider alternatives to targeted undergrounding: i.e. expanding the "spokes" of the grid model and investing in self-optimizing grid to reduce need for undergrounding

2	• Optimize between categories of the Grid Improvement Initiative (using cost/benefit framework)
	  ○ In particular, optimize between reliability and customer choice
	• Steps (for optimization of investment portfolios):
	  ○ Stabilize patient (maintenance) [Identify the investments categorized as maintenance]
	  ○ Maintain flexibility [Identify the trade-off options]
	  ○ Easy gives (win wins) [Identify the investments that can achieve win-win for Duke Energy and customers]
	  ○ Analyze tail risk exposure [Evaluate the impact of extreme events]

3	• Requirement (that Duke Energy consider) no capital asset that has been depreciated longer than 5 years • Prioritize non-wire alternatives over reliability • Include option that prioritizes performance-based metrics • Include option that prioritizes new market participants to meet grid requirements ○ To implement such a program, Duke Energy can release an RFP with goals and metrics, and potential vendors can explain what new technologies they are employing to meet those requirements • Consider a scenario where 50% generation is on distribution system (within 10 years) • Include trade-off analysis of 7 proposed Power Forward strategic programs in version 1.0 • Utilize customer-owned assets • Rate design changes vs. capital design changes
4	• Employ a transparent, market-based analysis • Compare minimum requirements to Power Forward in North Carolina • Enable an economic return on investment; “TRC-like” [Total Resource Cost] • Compare the cost/benefit of maximum deployment of renewable/EE with current generation portfolio • State economic impact for ratepayers • Perform analysis to maximize fossil fuel cost savings • Assess public health impacts • Perform analysis by customer class • Perform analysis to show cost/benefit of maintaining current reliability metrics

5	This group presented its feedback on the cost/benefit framework mainly in the form of questions for Duke Energy to consider:
	• How are costs allocated fairly for benefit? Duke Energy should articulate this.
	• Global analysis does not yield accurate cost/benefit analysis, since different customer classes are affected differently
	• How does an investment benefit different customer groups, and how much does it cost each group?
	• Is the benefit something we as customers can support, or at least hold us relatively happy?
	• Are these indirect or intangible benefits? Such benefits could include those that benefit the environment, community, or support Duke Energy’s core values.
	• How does Duke Energy prioritize projects and choose the best value/benefit for the money?
	• How much optionality does this provide customers?
	  ○ For example, quantify the cost/benefit of electric vehicles, Nest thermostats, TOU (time of use rates), and pay as you go billing options.
	  ○ Quantify the peak lead reduction

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How does grid improvement achieve a goal most cost-effectively? Duke Energy needs to define goals to drive toward
Is the Grid Improvement Initiative worth the investment if no standards are driving or requiring Duke Energy to do so?
Whatever you are doing, show us the numbers driving that decision.
How does it layer with other benefits?
Analyze/quantify more beyond just SAIDI, SAIFI
The current cost/benefit framework doesn’t consider customer class or cascading impacts
Establish a standard way of looking at programs/investments to prioritize and compare them equally
How much flexibility does it enable Duke Energy to pivot their initiative in the future?
Do policies support the Grid Improvement Initiative?
Want to avoid enabling flexibility through technology if policies will deter its benefit
What are the near-term impacts? What does near-term mean? What are the long-term impacts?

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Consider non-wire alternatives (microgrids, etc)
Consider if customer programs can achieve the same result or better (energy efficiency, demand-side management, demand response, solar, electric vehicles, etc)?
There is a discrepancy between the 1970s grid design and 21st century customer requirements. Consider the following criteria: does the improvement meet a 21st century requirement?

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Cost savings from deployment of technology (25%)
Provide customer rate impacts
Consider timing of return on investment

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Breakout discussion #3

Question 3: What analyses or inputs can you provide to Duke Energy to support developing these plans before the end of Q3? (include points of contact)

Summary of services offered

Several participants offered to provide analyses that their organizations have conducted to support Duke Energy in developing the Grid Improvement Initiative. Note that these offers are only preliminary, are non-binding, and were made with acceptance of attribution. The full list of services offered, along with their points of contact, are listed below.

- System planning analyses
  - Integrated system operated planning (ISOP) – Caroline Golin, Vote Solar

  - Distribution system planning practices, including storage – Dave Rogers, Sierra Club
  - Renewable resource planning – Mark Dyson, RMI [suggested by other participants]
- Economic impact studies
  - Economic impact data (trade-off analysis) – Steffanie Dohn, Southern Current
  - Upstate growth study and similar data – Shelley Robbins, Upstate Forever
- Distributed resources integration
  - Hosting capacity analysis – Caroline Golin, Vote Solar
  - EV infrastructure information – Dave Rogers, Sierra Club
  - How to use DERs to meet reliability goals – GridLab [suggested by other participants]
- Outage impact studies
  - Business impact and risk analysis of outages – Cleve Beaufort, BMW
- Business model reform
  - Performance-based metrics – Caroline Golin, Vote Solar
- Facilitation support
  - Facilitation of stakeholder meetings – Shelley Robbins, Upstate Forever

The following suggestions were provided without a point of contact:

- Develop a Michigan Consumers Energy-style IRP in support of grid modernization
- Leverage stakeholder involvement to get broader grassroots feedback
- Leverage available data to inform outreach strategy to underrepresented groups
- Develop a rate design that places the cost on the cost causer and not just the rate class
- Example of cost/benefit savings (e.g. AMI meters)
- Speak with other providers that have employed AMI

Breakout discussion #4

Question 4: What kinds of discussions do you suggest Duke Energy host or participate in before the end of Q4?

Common themes from flip chart notes:

- Stakeholder discussions need to include residential customers or organizations representing residential customers. In particular, direct engagement with rural communities that would be benefited by targeted undergrounding.
- Confirm that customers (of all classes) are willing to pay higher rates for reliability. This can be implemented through a customer survey.

- Prior to the October meeting, circulate a preliminary set of changes or amendments for comments in September. Subsequent stakeholder engagements should be targeted, small, and functional.
- Be clear and transparent about the goals of grid improvement, metrics to gauge success, and assumptions in provided analyses. This way, stakeholders can find agreement on the technical aspects of cost/benefit analyses.
- Demonstrate how grid improvements enable more distributed resources.

Full notes captured from flipcharts as below, with annotations in blue:

Table A3: Breakout discussion #4 full notes

Group #	Full Notes
1	● Directly engage with rural communities that would be benefited by TUG ● For the "time is now and need is clear" – discuss why *now*? ● Engage with customers using focus groups, webpage portal, and surveys. Disseminate via customer bill, media campaign
2	● Host targeted, small, functional stakeholder group discussions
3	● (There is) tension that comes from the average customer not understanding (the fact that) investment in the grid results in improvement of service that substantiates higher rates ● Host a discussion on customers' willingness to pay, particularly for reliability ● Determine how many solar customers would allow utility to use panel-generated power to supplement grid rather than just receive offsets
4	● Establish agreement/collaboration on technical aspects of cost/benefit analysis ● Engage customer-centric groups to get input/feedback ● Continue ex parte presentations with PSC, regarding stakeholder engagement and other topics
5	● Host a discussion on the options or scenario (goals) that Duke intends to run ● Establish clear goal with clear metrics to drive investments toward ● Provide transparency on goals and assumptions ● Demonstrate how improvements enable more DER, and compare to other system benchmarks
6	● Involve discussions with residential customers or organizations that represent residential customers. Be sure to include representation for low income customers. ● Establish process for evaluating ongoing grid-investment plans in a comprehensive manner (stakeholder, PSC-docket, etc) ○ Ensure the process includes thorough vetting and stakeholder input ● Complement October meeting (2.0) with prior redline amendments circulated (and potential meeting) for comments in ~September
7	● Collect customer survey data results, to determine if we are solving the right problem, and prove that customers want it

Appendix 2: Plenary record

Full notes: Duke Energy's presentation on lessons learned from North Carolina

- After fully deploying the Power/Forward initiative in Florida, Duke Energy is now taking a fresh look at South Carolina to address its unique needs for grid improvement.
- Duke Energy learned several lessons from its effort on the Power/Forward initiative in North Carolina, which will guide its process in South Carolina:
  - In North Carolina, Duke Energy unknowingly assumed that since grid modernization was intuitive to the Company, it must be intuitive to stakeholders as well. Duke Energy recognized this disconnect, and as a result, is putting together a two-pager outlining plans and motivations for grid improvement.
  - In North Carolina, Duke Energy assumed that the value proposition spoke for itself. While the value proposition is self-evident to Duke Energy representatives, they have decided to prove it to stakeholders through providing cost/benefit analysis.
  - In North Carolina, Duke Energy believed it knew what customers wanted, but learned after filing that this was not always true. Through this process, Duke Energy discovered that it shares a lot of common ground with stakeholders, and hopes to continue this at the South Carolina workshop.
- Duke Energy pointed out that there are a lot of legislative and regulatory activities in South Carolina, with the net metering issue and renewable policy. Duke Energy indicated that it does not want to talk about grid improvement in a vacuum, but rather in the context of those other activities.
- Duke Energy assured participants that this workshop is not simply just checking boxes, but that Duke Energy is committed to engaging stakeholders to inform the Grid Improvement Initiative.

Activity detail: Four ways of talking and listening

Description

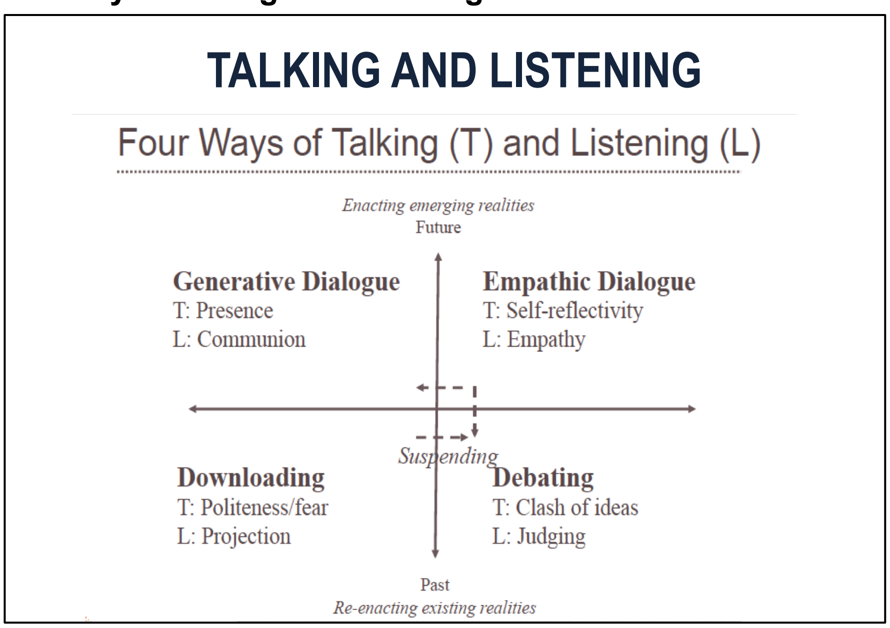
RMI presented a framework to encourage stakeholders to reflect on and practice engaging with one another differently, in order to open up collaboration.

The framework is characterized as four ways of talking and listening, described below:

1) **Downloading**: In downloading, the most common mode, we talk politely, saying what we are expected to say. We download (like from a computer file) or project (like a slide projector) our thoughts and feelings onto the world. This mode maintains the status quo. In this mode, the listener projects his or her own ideas and beliefs.
2) **Debating:** A team shifts from downloading to debating when someone speaks their mind openly, even at the risk of fragmenting the system. Actively searching for alternative facts, perspectives, and options represents a significant leap in the modes of conversation. In this mode, the listener is judging whether or not they agree with the speaker.
3) **Reflective dialogue:** Essential for deep change, reflective dialogue requires empathy and self-reflection. The listener is seeking to understand where the speaker is coming from.
4) **Generative dialogue:** A more rare mode of conversation, generative dialogue allows those who are talking and listening to discover their deeper shared purpose. Fully present, group members appreciate each other's different perspectives and they experience a moment of collective understanding.

Figure A1 illustrates the difference among the four modes.

Figure A1: Four way of talking and listening



Summary

Participants were asked to discuss the following question within their small groups: “What do I need to suspend to support dialogue this afternoon?” Select participants then volunteered to share their responses with the rest of the group in plenary:

- “I come from a legal background, where we’re used to fighting. Need to suspend my skepticism.”
- “I want to suspend the word ‘our’. It can be used and heard in several different ways, and can close or shut down dialogue. It’s not just Duke’s project – it’s everyone’s in the room.”
- “I am suspending the thought: ‘We’ve had an electrical grid that has worked for 100+ years that’s affordable. Why does that need to change? It’s worked well.’ We should respond to why it needs to change, what customers are wanting, and how Duke is meeting new needs of customers in new generation of electricity.”
- “I felt like North Carolina workshop was a band aid or hand-wavy process. I am suspending this assumption for the rest of the day.”

Activity detail: Q&A following Duke Energy’s presentations

Description

A presentation from Duke Energy covered the unique factors in South Carolina that form the basis for the proposed grid investment initiative. Duke Energy also circulated a handout describing a framework for evaluating the cost-benefit and cost-effectiveness of proposed investments. In response to both the presentation and the handout, participants had a chance to ask clarifying questions that were answered in real-time by Duke Energy representatives. This provides a full record of the questions raised and answers provided in this session.

- *[Question from participant]* The decision tree doesn’t point to what project you do first. How does this framework allow Duke to prioritize projects?
    - *[Response from Duke Energy]* The decision tree is for one specific project; need to spread them all out on the “table” to compare projects. Also identify if there are stacking effects.
- What method will we pursue to recover the costs?
    - We do not know yet. In North Carolina, we proposed a rider, deferral as alternative.
        - In South Carolina, we will be having proceedings later this year. Through this workshop, we want to get feedback from you and shape our plans.
- The white paper discussed how 98% of outage costs were for businesses. But targeted undergrounding (TUG) primarily benefits the residential class. How are TUG costs spread amongst customer classes?

- Benefits may be aligned or misaligned with costs for each class.
- If there is subsidization between classes, we have to determine if it is fair.
- Currently, the grid improvement plan is a more traditional cost of service regulation. We are looking at further refinement to that through the rate case.

- Regarding the weather study, there is an aggressive limb trimming program. What is the nature of weather-related outages, given this aggressive trimming? If you underground the lines, you are probably going to take out those trees. Would like more granularity: what % of outages is caused by tree problems?
  - We trim trees on a 5-year schedule. Over 50% of the tree-related outages come from trees outside of the right-of-way. Right-of-way is 30 feet from distribution lines.
  - Tree-related outages account for 30% of outage, so TUG can prevent a total of 15% of outages.
  - We acknowledge that we have not done a great job communicating these details to the public.
- Would TUG necessitate taking down more trees?

  Only if necessary; Duke Energy would seek customer approval.
- Are we looking at the cost benefit analysis for 10 years, or 30 years? Generation assets are for 30-50 years, but this is being assessed for 10 years. Is the cost-benefit framework structured to evaluate capital assets or goals? What is the actual goal and tangible metrics to measure it? For example, “a 30% reduction in SAIDI”.
  - Analyses in the near-term will be quantitative, but as we get farther in the future, it’s more qualitative. Agree that we should start with a goal, then back out the calculations to identify investments.
  - We are focusing on projects with clear NPV benefits.
  - In our request for proposals for third-party consultants to perform cost-benefit analysis, we encourage applicants not to validate our findings but challenge what we’ve done.
- I would like to see Duke rank-order grid modernization plans. What is not on customer’s priority? Do they care about commercial & industrial customers? How much are they willing to pay to reduce the outage? What if they’re okay with current reliability?
  - We are hoping to identify in version 2.0 what are the undeniable truths that all customers want (anticipate this will be a small list), and what is optional? There is a large range of what customers want.
  - Most investments will benefit certain customer classes, but not others.
  - How to capture the sweet spot that benefits a large majority of different customers?

- What are the federal guidelines on grid modernization?
    - NERC is not regulating on the distribution side.
- Are there national standards for cybersecurity?
    - Yes, issued by NERC.
- What % of your spending on cybersecurity relates to what is mandated by NERC?
    - I do not remember the exact numbers, but we go roughly 20-30% beyond NERC standards.
    - I think a large majority of our cybersecurity spending is for mandated requirements. This is all transmission-related. On the distribution side, no requirement exists.
- What about version 1.1, 1.2? This document was written in January. Before we start commenting on 1.0, where are you now?
    - We have not put a stake in the ground for 1.1 – we're moving toward 2.0. We are working on better analytics, and how to scale down the more contentious projects.
    - We are focusing on projects with clear NPV benefits.
    - The moves that's apparent to us include TUG, hardening on the distribution side, transmission hardening and resiliency.
- Are there certain projects that are not up for debate?
    - If there is something that the group wants that is not on that list, please tell us.
- To what degree are these projects your everyday responsibility?
    - We are trying to articulate that through the maintenance vs. modernization document.
    - We are proposing an acceleration on maintenance work.
- Does the proposed rider have to be approved by PSC?
    - There isn't one now. Should there be one, it has to be approved by PSC.